

ROYAL BOTANIC GARDENS, KEW.

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OF

MISCELLANEOUS INFORMATION.

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XXV.—GARDEN NOTES ON NEW TREES AND SHRUBS.

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III. New Chinese Species.

The following notes on new additions to the collections of ligneous plants have been prepared in continuation of those already published in the *Kew Bulletin*, 1909, p. 353, and 1910, p. 45.

Larix Potaninii, *Batalin* [Coniferae].

Messrs. Veitch have recently presented to Kew a healthy plant of this interesting and extremely rare larch, one of a batch growing in their Coombe Wood nursery raised from seed sent from China by Wilson in 1904. There appear to be only two species of larch in China, namely, *L. chinensis*, Beissner, about which little is known in this country but which appears to be in cultivation on the continent, and the one under notice. *L. Potaninii* is a tree reaching 60 to 70 feet in height, with a trunk 2 feet in diameter; it is a native of Szechuan, near Tatienlu, and is said to produce the most valuable timber in the west of China. Several of the larches are very similar to each other in the leaves and general appearance, but Mr. Henry distinguishes this by its having the leaves deeply keeled on both surfaces, and by the branchlets being light yellow. The cone is cylindrical, $1\frac{1}{2}$ to $1\frac{3}{4}$ inches long, about 1 inch wide; the scales are roundish, $\frac{1}{3}$ inch long, and beyond them the bracts protrude about $\frac{1}{4}$ inch. The leaves are 1 inch or less in length. Coming from altitudes up to 11,500 feet, this larch will, no doubt, prove to be as hardy as any species in cultivation.

By the kind permission of Professor Sargent, Arnold Arboretum, Harvard University, photographs of this tree and of the following species (*Meliosma Veitchiorum*), taken by Mr. E. H. Wilson, in China, are reproduced on the accompanying plates.

Meliosma Veitchiorum, *Hemsley* [Sabiaceae].

Few trees introduced by Mr. Wilson from China are of such great interest and promise as this. The Natural Order to which it belongs is only represented among hardy trees and shrubs by the

genus *Meliosma*, and until recent Chinese explorations, that genus was only known in the out-door garden by a single rather tender species—*M. myriantha*. *M. Veitchiorum* is a deciduous tree 40 to 50 feet high with very thick young shoots covered with a rust-coloured pubescence. The leaves are pinnate, 2 to 3 feet long, with usually 9 or 11 leaflets, the largest of which are 6 to 8 inches long, 3 to 3½ inches wide, ovate or oblong, pointed. The flowers are white, small ($\frac{1}{8}$ inch in diameter) and appear in an erect terminal panicle, or cluster of panicles, pyramidal in outline and up to 18 inches high.

As a foliage tree, this new species—which was discovered for Messrs. Veitch in South Wushan, W. China, and introduced in 1900, promises to equal the finest of the walnuts, sumachs, and other popular pinnate-leaved trees in cultivation, and it promises a considerable beauty of flower also. There are exceedingly few trees in Europe, but Messrs. Veitch have kindly presented one to Kew. It has been planted between No. I. (Aroid) House and the Main Entrance to the Gardens. So far as can be judged at present, it is quite hardy. Mr. Wilson found it in flower in June at elevations of 5000 to 7500 feet.

Portya sinensis, *Oliver* [Compositae]; Hooker's *Icones Plantarum*, t. 224.

Whilst this shrub is not likely to become in any way popular in gardens, it is an interesting addition to the hardy shrubby *Compositae*, which at present form but a small group in gardens. It was originally discovered in the province of Hupeh, China, by Mr. A. Henry, in 1889, and was again found by Mr. Wilson in 1901. From seeds sent home by him to Messrs. Veitch, plants were raised at Coombe Wood, one of which was presented to Kew, where it has proved very hardy and flowers in June annually. It is a deciduous shrub, 4 to 6 feet high, of bushy habit with slender ribbed branches. Leaves alternate, ovate-lanceolate, acuminate, 2 to 3 inches long, $\frac{3}{4}$ to 1 inch wide, on the shoots of the year; but on the year-old branches produced four or six together in fascicles, and less than half the size of the others. Flower-heads pink, $\frac{1}{2}$ inch across, surrounded by an involucre of oval, membranous, imbricating scales, solitary in the centre of each fascicle of leaves and produced on a slender peduncle $\frac{1}{2}$ to 1 inch long. The young leaves are extremely bitter.

Picea complanata, *Masters* [Coniferae].

The spruces belonging to the *Omorika*, or flat-leaved section of the genus, exist in curiously separated parts of the globe. The best known and commonest is the Sitka spruce (*P. sitchensis*), from N.W. America, and for a good many years two or three from Japan and one from S.E. Europe (*P. Omorika*), have been in cultivation. Recently, a Himalayan species (*P. morindoides*), has been discovered in various gardens. The last comer is *P. complanata*, found by Wilson in Western Szechuan in 1901, and introduced at the same time to the Coombe Wood nursery. Messrs. Veitch have recently presented a plant to Kew.

In its foliage *P. complanata* very much resembles *P. sitchensis* and *P. morindoides*, having needle-shaped leaves $\frac{3}{4}$ to 1 inch long,



LARIX POTANINII.



MELIOSMA VEITCHIORUM.

with the glaucous lines of stomata on one side (the upper one) only. The cones, of course, are only known from Wilson's collected specimens; they are cylindrical, but taper towards both ends and are 4 to 5 inches long, $1\frac{1}{4}$ inch wide in the middle, the scales somewhat oyster-shell-shaped, slightly toothed on the upper edge. As this tree grows at elevations up to 8000 feet in Western Szechuan, where it constitutes whole forests, it will, no doubt, prove quite hardy in this country.

Pyrus Folgeneri, C. K. Schneider [Rosaceae].

Among the numerous forms of *Pyrus* introduced from China by Wilson for Messrs. Veitch, this stands out as a particularly promising acquisition for gardens. As seen in the Coombe Wood nursery, it is a slender tree with graceful, often pendulous branches, and according to Mr. Henry, who first discovered it in Hupeh, it varies from 10 to 30 feet in height. The leaves are of the *Pyrus Aria* type, oval, tapering towards each end, 2 to $3\frac{1}{2}$ inches long, $\frac{3}{4}$ to $1\frac{1}{2}$ inches wide, serrulate, dark green and glabrous above, covered beneath with a vividly white felt. Flowers white, in lax corymbs, followed by red, egg-shaped fruits $\frac{1}{4}$ inch long. This tree belongs to the *Micromeles* group of *Pyrus*, which is nearly allied to the *Aria* group, but differs in the much smaller flowers with an epigynous (not perigynous) disk, and in the small fruits crowned with a ring-like scar left by the fallen calyx.

For gardens the graceful habit and slender, often whip-like branches, the white undersurface of the leaves and the abundant clusters of red fruits unite to make *Pyrus Folgeneri* a very attractive small tree. It has recently been presented to the Kew collection by Messrs. Veitch.

Staphylea holocarpa, Hemsley [Sapindaceae].

The *Staphyleas* or Bladder-nuts are already represented in gardens by two popular species—*S. pinnata* and *S. colchica*—and by a hybrid between them, *S. Coulombierii*. There are also two or three other species of less note. *S. holocarpa* is a new species first discovered about 1887 by Mr. A. Henry in the province of Hupeh, Central China, and was described by Mr. Hemsley in the *Kew Bulletin*, 1895, p. 15. Nothing more was heard of it until Mr. Wilson's last journey to China, when he collected an abundance of seeds, some of which were presented to Kew in 1908 and germinated freely. It promises to be a taller and stronger grower than any of the older species. Mr. Wilson tells me he saw it occasionally 30 feet high—a genuine tree with a well-formed trunk. The leaves are glabrous, except when quite young, and are composed of three distinct leaflets, which are narrowly oval, finely toothed, $2\frac{1}{2}$ to 4 inches long, 1 to $1\frac{3}{4}$ inches wide, the petiole 2 to 3 inches long, the lateral pair of leaflets almost sessile, the terminal one stalked. Flowers pink, each $\frac{1}{2}$ inch long, produced in corymbs 1 to 2 inches long and wide. The capsule has the bladder-like form characteristic of the genus, and is pear-shaped and $1\frac{1}{2}$ to 2 inches long. Plants raised from seed in the spring of 1908 have withstood the two past winters without injury. It is unfortunate that, owing probably to a clerical error when the seeds were distributed, this plant is growing in several collections as "*S. lobocarpa*."

Syringa pinnatifolia, *Hemsley* [Oleaceae].

Although for many years there has been in cultivation a variety of the Persian lilac with pinnatifid leaves, a species with genuinely pinnate leaves is a distinct novelty. *S. pinnatifolia* was discovered in Western China by Wilson in 1904, and was introduced by him for Messrs. Veitch. According to its discoverer it is a bush 6 to 8 feet high, with slender branches and very elegant habit. The leaves are 2 to 3 inches long, composed of seven to eleven leaflets, which are sessile, ovate-lanceolate, $\frac{3}{4}$ to $1\frac{1}{2}$ inches long, $\frac{1}{4}$ to $\frac{3}{8}$ inch wide. The flowers are white with a slight tinge of lilac, produced in axillary panicles $1\frac{1}{2}$ to 3 inches long. The corolla is of the ordinary narrowly tubular shape, $\frac{1}{2}$ inch long, the spreading lobes $\frac{1}{8}$ inch long. The terminal portion of the leaf frequently shows a tendency to become pinnatifid instead of wholly pinnate. The species, which has recently been added to the Kew collection by the kindness of Messrs. Veitch, will no doubt be hardy, and will probably prove as ornamental in gardens as the white Persian lilac.

Tripterygium Wilfordi, *Hook. f.* [Celastraceae].

In June, 1858, Charles Wilford, a young man then collecting for Kew in Formosa, first discovered this shrub on the banks of the river Sanar, on the north-west side of that Island. It was again collected in 1864 in Formosa by Wilford's successor, the clever but ill-fated Richard Oldham, and since then it has been found in Corea, Japan and (by Mr. Henry) in Yunnan. But no attempt appears to have been made to introduce it alive until 1905, when Mr. J. G. Jack, of the Arnold Arboretum, visiting Corea, collected it and introduced it to the United States. Since then it has been sent to Kew by Professor Sargent.

It is a vigorous climbing shrub with angular, warty stems and deciduous alternate leaves, which are broadly ovate, long-pointed, cuneate or obliquely truncate at the base, crenately toothed, the largest 6 inches long and 4 inches wide; the smallest only one-quarter those dimensions. Flowers white, produced in panicles of varying size at the end of the shoot and in the axils of the terminal leaves, the whole making an inflorescence 6 to 12 inches long. Fruit three-angled and with three erect longitudinal wings; the wings $\frac{3}{4}$ inch long and $\frac{1}{4}$ inch wide. The fruit has little ostensible resemblance to the other hardy *Celastraceae*, like *Euonymus* and *Celastrus*, and suggests more strongly a Wych Elm fruit with an extra wing. But the species, which is monotypic, belongs to the *Elaeodendron* group, which has no other hardy representative in this country.

Tsuga yunnanensis, *Masters* [Coniferae]; Gard. Chron. April 14, 1906, fig. 93. (*Abies yunnanensis*, Franchet).

Any addition to the group of handsome and graceful conifers known as *Tsuga* is welcome. This new species is a native of Western and Central China and was first discovered by the Abbé Delavay in Yunnan; later collectors, including Henry, Pratt and Wilson, found it in Szechuan and Hupeh. It was introduced by Wilson for Messrs. Veitch in 1900, and from their stock at Coombe Wood a plant has recently been obtained for Kew. Its leaves are from $\frac{1}{3}$ to 1 inch long, linear with entire margins, pointed in young

specimens, becoming blunt and rounded in adult trees, with the stomatal lines faintly marked beneath. The young wood is hairy, which distinguishes it from *T. Sieboldii*; and from *S. diversifolia*, which also has hairy young wood, it differs in its longer, larger leaves. The cone is about 1 inch long and the same in width, sessile.

IV. A New Oak.

Quercus pontica, C. Koch [Cupuliferae].

This striking oak has long been a desideratum for the Kew collection. It is a native of north eastern Armenia, whence it appears to have first been introduced to Germany by Dr. Dieck, of the Zöschchen Nursery, about twenty-five years ago. It is, however, extremely rare, and it was not until I saw it in Messrs. Späth's nursery at Berlin, in 1908, that it became possible to obtain it, for it is not offered in catalogues. There is also a good specimen in the Botanic Garden of Dresden. In the Kew Herbarium it is only represented by a single sheet containing a flowering twig and one with three fully-grown leaves.

This oak appears to be a small tree, sometimes a shrub; its leaves are oval or slightly obovate, and up to 8 inches in length and 4 inches in width, and are distinguished by reason of fifteen to twenty-five prominent ribs running parallel to each other from the mid-rib at an angle of about 40 deg. to the margin, where each one terminates in an incurved lanceolate tooth $\frac{1}{4}$ inch long. The upper surface is a bright, rather pale green; the lower one glaucous. Petiole about $\frac{1}{4}$ inch long. I have not seen the acorn either living or preserved, but it is described as being half enclosed in a cup with ovate lanceolate scales.

The affinities of the species appear to be with *Q. castaneaefolia*, but it is also comparable with *Q. Mirbeckii*, and *Q. conferta*. In the beauty of its foliage it is superior to all three.

EXPLANATION OF PLATES.

Larix Potaninii, 70 feet $\times$ 6 feet; west of Tatienl $\ddot{u}$; altitude 10,800 ft.

Meliosma Veitchiorum, 45 feet $\times$ 10 feet, with votive board; Changyang Hsien; altitude 4800 ft.

XXVI.—ENTANDROPHRAGMA, LEIOPTYX AND PSEUDOCEDRELA.

T. A. SPRAGUE.

The genus *Entandrophragma* (Meliaceae) was described in 1894 by Casimir De Candolle (Bull. Herb. Boiss. vol. ii. p. 582, t. 21) who based it on *Swietenia angolensis*, Welw., and distinguished it from *Swietenia* by the presence of a stipitiform disk, to which the lower part of the staminal tube was connected by means of ten longitudinal membranous partitions.

In 1895 Harms described the genus *Pseudocedrela*, which he distinguished from *Swietenia* and *Entandrophragma* by the seed being provided with a wing pointing to the base of the capsule, as against the apex (Engl. Jahrb. vol. xxii. p. 153); and in 1896 he used this character together with the nature of the insertion of the anthers in his key to the genera of *Swietenioideae* (Engl. & Prantl, Nat. Pflanz. vol. iii. 4. p. 270).

Two additional species of *Entandrophragma* were described within the next three years: *E. Candollei*, Harms in Notizbl. Bot. Gart. Berlin, vol. i. 1896, p. 181, from the Cameroons; and *E. Candolleana*, De Wild. & Th. Dur., Contrib. Fl. Congo, vol. i. fasc. 1, p. 14, from the Congo State. The capsule and seeds were unknown in both cases.

In 1905, in the course of an expedition through Buddu and the Western and Nile Provinces of the Uganda Protectorate, Mr. M. T. Dawe collected material of several important timber trees belonging to the *Meliaceae*, including two species which, in the absence of flowers, were referred to the genus *Pseudocedrela* on account of the nature of their fruit and seeds: the wing of the seed pointing to the base of the capsule. As both species were large forest trees yielding valuable timber, it was thought desirable to describe them, although flowers were not known, and they were, accordingly, published as *Pseudocedrela excelsa*, Dawe & Sprague, and *P. utilis*, Dawe & Sprague, respectively (Journ. Linn. Soc. Bot. vol. xxxvii. 1906, p. 511).

Two additional species, obviously congeneric with *P. excelsa* and *P. utilis*, were received subsequently from the Transvaal and the Gold Coast respectively, and were described as *P. caudata*, Sprague, and *P. cylindrica*, Sprague (Kew Bull. 1908, pp. 163, 257).

During a visit to the Budongo Forest early in 1910, Mr. Dawe obtained flowers of *Pseudocedrela utilis* and *P. cylindrica*, which he has forwarded to Kew. These showed the structure characteristic of *Entandrophragma*, namely, a stipitiform disk and a partitioned staminal tube. A capsule of *Entandrophragma angolense* preserved in the Kew Museum was accordingly examined and it was found that the wing of the seed pointed to the base of the capsule just as in *Pseudocedrela*. It thus became evident that the seed of *Entandrophragma* had been incorrectly described, and that several of the species published under *Pseudocedrela* would have to be transferred to *Entandrophragma*.

The mistake in the description of the seeds appears to have arisen as follows: Casimir De Candolle described the seeds as "superne alata," apparently meaning thereby that the seeds were winged at the end opposite to their place of attachment. Unfortunately, however, the phrase "semina superne alata" had been used in quite a different sense by Bentham & Hooker (Gen. Pl. vol. i. p. 338) and by C. De Candolle himself (Monogr. Phan. vol. i. p. 723), as meaning that the seeds were provided with a wing pointing to the apex of the capsule; and in this more usual sense it was naturally interpreted by Harms.

Although flowers are not known of *Pseudocedrela excelsa* and *P. caudata*, it may safely be assumed that these two species belong to

Entandrophragma, as they are obviously much more closely related to *P. utilis* and *P. cylindrica*, which are now known to be species of *Entandrophragma*, than to *P. Kotschyi*, on which the genus *Pseudocedrela* was founded.

The distinguishing characters of *Entandrophragma* and *Pseudocedrela* may now be summarised as follows:—

Entandrophragma: disk stipitiform; lower part of staminal tube partitioned; valves of the capsule not connected by a fibrous network after dehiscence; cotyledons elliptic or ovate; leaflets entire.

Pseudocedrela: disk cupular; staminal tube not partitioned; valves of the capsule connected by a fibrous network after dehiscence; cotyledons obovate; leaflets repand-dentate.

The genus *Leioptyx*, which was described by De Wildeman in 1908 (*Etudes Fl. Bas- et Moyen-Congo*, vol. ii. p. 258, tt. 76–77), has since been reduced to *Entandrophragma* by Aug. Chevalier (*Veg. Ut. Afr. Trop. Franç. fasc. 5*, p. 200). According to Chevalier, two distinct species are included under De Wildeman's description and figures of *Leioptyx congoensis*: *Entandrophragma Pierrei*, A. Chev., based on specimens collected at Ogowe, French Congo, by Jolly (*Etudes Fl. Bas-et Moyen-Congo*, vol. ii. t. 76, ff. 2–7); and *Entandrophragma congoense*, A. Chev., based on material collected at Eala, Congo State, by Pynaert (t. 76, ff. 1, 8–10; t. 77).

As Chevalier (l.c.) has described five additional species of *Entandrophragma*, none of which is represented at Kew, it is not possible at the moment to give a key to the species. In view of their economic importance, however, it seems desirable to give an enumeration of those hitherto described along with their geographical distribution, as far as it has been ascertained. The species are arranged in chronological order.

Entandrophragma, C. DC. in Bull. Herb. Boiss. vol. ii. 1894, p. 582, t. 21; Harms in Engl. & Prantl, Nat. Pflanz. vol. iii. 4. p. 273; A. Chev. *Veg. Ut. Afr. Trop. Franç. fasc. 5*, p. 200.—*Leioptyx*, Pierre ex De Wild. *Etudes Fl. Bas- et Moyen-Congo*, vol. ii. 1908, p. 258.

1. *E. angolense*, C. DC. l.c.; Hiern Cat. Welw. Afr. Pl. vol. i. p. 135. *Swietenia angolensis*, Welw. Apont. p. 561; C. DC. Monogr. Phan. vol. i. p. 724.

Capsule pendulous, dehiscing from the base upwards, valves cohering above, deciduous in the form of a calyptra, then separately arching outwards. Hilum of seed linear.

ANGOLA. Golungo Alto, *Welwitsch*, 1313! UGANDA. Western Province: Budongo Forest, *Dawe*, 984! The specimens sent by Dawe differ somewhat from the type: the midrib on the lower surface of the leaflets being much less pilose, and the calyx rather larger (4.5 mm. in diameter). The differences observed do not seem to warrant separation as a distinct species.

According to Mr. Dawe, this species is of considerable economic importance. It is more abundant than *E. utile*, and is distributed over a considerable portion of the Budongo Forest at an average of about 1 tree to the acre.

2. *E. Candollei*, *Harms* in *Notizbl. Bot. Gart. Berlin*, vol. i. 1896, p. 181.

Capsule and seeds not known.

CAMEROONS. Johann Albrecht's-Höhe, *Staudt*, 459!

3. *E. Candolleianum*, *De Wild. et Th. Dur.*, *Contrib. Fl. Congo*, vol. i. fasc. 1, 1899, p. 14; *Ill. Fl. Congo*, p. 125, t. 63; *Reliq. Dewevr.* 41.

Capsule and seeds not known.

CONGO STATE. Stanley Falls region, *Dewèvre*.

4. *E. excelsum*, *Sprague*, *comb. nov.*—*Pseudocedrela excelsa*, *Dawe & Sprague* in *Journ. Linn. Soc. Bot.* vol. xxxvii. 1906, p. 511.

Position and mode of dehiscence of the capsule not known. Seeds attached in the middle of each face of the central column; hilum elliptic.

UGANDA. Western Province: West Ankole Forest, *Dawe*, 358!

5. *E. utile*, *Sprague*, *comb. nov.*—*Pseudocedrela utilis*, *Dawe & Sprague* l.c.; *H. N. Thompson*, *Gold Coast, Report on Forests*, t. 13.

Capsule pendulous, dehiscing from the apex downwards. Seeds attached in the middle of each face of the central column; hilum elliptic or narrowly oblong.

UGANDA. Western Province: Budongo Forest, *Dawe*, 786! 1002! GOLD COAST. Near Nyinahin, *Thompson*, 48!

The capsule collected by Thompson differs from the type in having the central column considerably produced above the uppermost seed.

Mr. Dawe writes of this species as follows: "*Pseudocedrela utilis* is now (mid-February) in full flower, but capsules still hang on the trees in some cases, and seeds are available although it appears rather late for them. The tree is easily recognised, not only by its distinct fruits, but by its bark, which is brownish and roughly channelled, whereas the bark of the other three (?) species [which occur in the Budongo Forest] is almost smooth, is lighter in colour and scales off in irregular pieces."

6. *E. caudatum*, *Sprague*, *comb. nov.*—*Pseudocedrela caudata*, *Sprague* in *Kew Bull.* 1908, p. 163.

Capsule pendulous, dehiscing from the apex downwards. Seeds attached near the middle of each face of the central column; hilum small, elliptic.

TRANSVAAL. Zoutpansberg District: Blauwberg, *Baily in Transv. Dep. Agric. Herb.*, 2926!

7. *E. cylindricum*, *Sprague*, *comb. nov.*—*Pseudocedrela cylindrica*, *Sprague* in *Kew Bull.* 1908, p. 257 (July 3); *H. N. Thompson*, *Gold Coast, Report on Forests*, t. 10.

Capsule pendulous. Seeds attached alternately to the right and left of each face of the central column.

GOLD COAST. Near Mansu and Supom, *Thompson*, 16! near Tsifufu, *Thompson*, 34! SOUTHERN NIGERIA. Western Province, *Thompson*, 10! UGANDA. Western Province: Budongo Forest, *Dawe*, 983!

8. *E. Pierrei*, *A. Chev.*, Veg. Ut. Afr. Trop. Franç. fasc. 5, p. 203.—*Leioptyx congoensis*, De Wild., Etudes Fl. Bas- et Moyen-Congo, vol. ii. 1908, p. 259, partly, t. 76, f. 2-7.

Position and mode of dehiscence of the capsule not known. Seeds attached alternately to the right and left of each face of the central column.

FRENCH CONGO. Ogowe, *Jolly*.

9. *E. congoense*, *A. Chev.*, l.c.—*Leioptyx congoensis*, De Wild., Etudes Fl. Bas- et Moyen-Congo, vol. ii. 1908, p. 259, partly, t. 76, ff. 1, 8-10, t. 77.

Capsule dehiscing from the base upwards. Seeds attached in the middle of each face of the central column.

CONGO STATE. Eala, *Pynaert*, 367.

10. *E. ferrugineum*, *A. Chev.*, l.c. 195, 284.

Capsule erect, according to Chevalier; attachment of seeds not mentioned.

IVORY COAST. Middle course of the Comoé River; Mbassa, *Chevalier*, 16261.

11. *E. macrophyllum*, *A. Chev.*, l.c. 196, 278, 280.

Capsule erect, dehiscing from the base upwards, valves cohering above, deciduous in the form of a calyptra. Seeds attached alternately to the right and left of each face of the central column; hilum linear.

IVORY COAST. Here and there throughout the forest, *Chevalier*, 16136, 16146, 16147, 16181.

12. *E. rufum*, *A. Chev.*, l.c. 201, 278.

Capsule and seeds not known.

IVORY COAST. Here and there in the forest, apparently rather rare, *Chevalier*, 16166.

13. *E. macrocarpum*, *A. Chev.*, l.c. 203.

Position and mode of dehiscence of the capsule, and mode of attachment of the seeds not mentioned. I suspect, from the description, that this species may be conspecific with *E. utile*.

IVORY COAST. Middle course of the Sassandra River; Guidéko, *Chevalier*, 16390.

14. *E. septentrionale*, *A. Chev.*, l.c. 205, 276, 278.

Capsule erect, dehiscing from the base upwards. Mode of attachment of the seeds not mentioned.

IVORY COAST. Fairly frequent in the forest between Cavally and Indenié and Sanwi, *Chevalier*, 16126, 16145, 16158.

15. *E. sp.*—*Pseudocedrela sp.* (near *P. cylindrica*), Thompson, Gold Coast, Report on Forests, t. 12.

GOLD COAST. Near Tsifufu, *Thompson*, 36!

Pseudocedrela, *Harms* in Engl. Jahrb. vol. xxii. 153; et in Engl. & Prantl, Nat. Pflanz. vol. iii. 4. p. 272.

P. Kotschy, *Harms*, l.c. 154; l.c. 273.—*P. Chevalieri*, C. DC. in Bull. Soc. Bot. France, vol. liv. Mém. 8, 1907, p. 12. *Cedrela Kotschy*, Schweinf. Reliq. Kotsch. p. 36, t. 35. *Soyimida roupali-folia*, Schweinf. l.c. 37. *Boswellia sp.*?, Oliv. in Trans. Linn. Soc. vol. xxix. p. 44.

GOLD COAST. Northern Territories : Bere, *Dudgeon*, ser. II. 105 ! LAGOS. *E. W. Foster*, 17 ! NORTHERN NIGERIA. Katagum District, *Dalziel*, 218 ! Nupe : Jeba, *Barter*, 1633 ! 1712 ! EASTERN CHARI. Snoussi Country : Ndelle, *Chevalier*, 7478 ! 7803.

GALABAT. Matamma, *Schweinfurth*, 2249 ! UPPER SENNAR. Near Fazokl, *Cienkowski*, 93. SUDAN. Sobat River, 20 miles below Nasser, *Muriel*, L. 104 ! JUR. Seriba Ghattas, *Schweinfurth*, 1333 ! UGANDA. Nile Province : Acholi, *Dawe*, 843 ! Madi, *Grant*, 739 !

XXVII.—DIAGNOSES AFRICANAE: XXXVI.

1091. *Thesium atrum*, *A. W. Hill* [Santalaceae] ; species nulli arcte comparanda, *T. doloensi*, Pilger, similis in sicco nigrescens sed foliis et bracteis minutis orbiculari-ovatis marginibus ciliatis distincta.

Suffrutex perennis, rhizomate lignoso ; caules plurimi, prostrati, lignosi, robusti, 30 cm. vel plures longi, rami adscendentes, in sicco nigrescentes, 10–15 cm. longi, ramulis lateralibus aliis elongatis aliis brevibus numerosis instructi. *Folia* squamiformia, orbiculari-ovata, subacuta, 1 mm. longa, carnosa, margine minute ciliolata. *Flores* versus apices ramulorum foliatorum axillarium dispositi : bractee bracteolaeque foliosae, apiculatae, involucrum formantes. *Perianthium* album, 1.75 mm. longum, segmentis 1 mm. longis ovatis subacutis glabris paullo cucullatis marginibus membranaceis subpapillois. *Antherae* filamentis aequilongae, 0.4 mm. longae. *Stylus* 1 mm. longus. *Fructus* in sicco ater, globoso-ovoides, 2.5 mm. longus, 2 mm. latus, costis et venis inconspicuis.

ANGOLA. Suassingua, *Gossweiler*, 2713 (Herb. Mus. Brit.).

1092. *Thesium brachyanthum*, *Baker* [Santalaceae] ; species distincta caulibus profunde sulcatis foliis carinatis membranaceis reductis ; *T. subaphyllo*, Engl., paullo affinis bracteis bracteolis inflorescentiisque elongatis differt.

Suffrutex, caulis erectus, 30 cm. altus, glaber, quadrangularis, angulis plus minusve alatis profunde sulcatis ramis numerosis fastigiatis. *Folia* squamiformia, ovata, acuta, 2–3 mm. longa, membranacea, conspicue carinata. *Flores* in spicas laxas elongatas terminales dispositi ; bractee et bracteolae ovatae, acutae, 2–3 mm. longae, membranaceae, carinatae. *Perianthium* circiter 1.5 mm. longum, segmentis 1 mm. longis elliptico-ovatis subacutis glabris. *Antherae* 0.5 mm. longae. *Stylus* circiter 1 mm. longus. *Fructus* turbinatus, 3 mm. longus, costis conspicuis et reticulationibus transversis instructus.

NYASALAND. Tanganyika plateau : Fort Hill, *Whyte*.

1093. *Thesium cinereum*, *A. W. Hill* [Santalaceae] ; species dense pilosa *T. lycopodioidi*, Gilg, et *T. striguloso*, Welw., similis sed pedunculis nudis axillaribus elongatis uti ramulis gracilibus, stylo brevi differt.

Herba vel suffrutex perennis, caudex ramosus, planta omnino dense cinereo-pilosa ; caules prostrati, cylindrici, sulcati, 15–30 cm. longi, ramulis floriferis axillaribus filiformibus dense obtecti. *Folia* subulata, acuta, 2–5 mm. longa, dorso pilosa. *Inflorescentia* 1–3-flora,

pedunculis ebracteatis axillaribus 2–8 mm. longis nonnunquam in ramulos foliosos filiformes e bracteolarum axillis productis. *Flores* involucri bracteolarum lineari-subulatarum cincti. *Perianthium* extus viride, dense pilosum, intus albidum, 2 mm. longum, segmentis 1–1.25 mm. longis margine membranaceis, prope basin pilosis marginibus et apicibus inflexis. *Antherae* circiter 0.5 mm. longae. *Stylus* 0.2 mm. longus. *Fructus* globoso-ovoideus, circiter 2 mm. diametro, dense hirsutus, costis et reticulationibus conspicuis.

ANGOLA. Malange District: near Saba Onatunga in company with perennial *Leguminosae*, Gossweiler, 1115.

1094. *Thesium cymosum*, A. W. Hill [Santalaceae]; species floribus plus minusve regulariter in dichasia dispositis et ramulis corymbosis distinguenda.

Herba perennis, compacta; rhizoma repens horizontale; caules erecti, circiter 15 cm. alti, pauci, superne subdichotomi, multiramosi, quadrangulares, profunde sulcati, costis conspicuis. *Folia* basi squamiformia, superne anguste elliptica vel linearia, acuta, conspicue carinata, 5–6 mm. longa. *Flores* singuli vel in dichasia 3-flora dispositi; pedunculi axillares, bracteis foliosis plus minusve adnati; bracteolae 2, 2.5 mm. longae. *Perianthium* 2.5–3 mm. longum, segmentis 2.25 mm. longis ovato-deltoides cucullatis glabris vel margine minute ciliolatis. *Antherae* filamentis aequilongae, 0.75 mm. longae. *Stylus* 1.5–1.75 mm. longus. *Fructus* ovoideus; circiter 2.5 mm. longus, costis 5 et reticulationibus conspicuis.

NYASALAND. Near the foot of Tshiradzura (Chiradzulu) mountain, Kirk; Mount Zomba, Buchanan, 122; Chikala, 610 m., Purves, 25.

1095. *Thesium ephedroides*, A. W. Hill (Santalaceae); species ramulis multicostatis patulo-erectis rigidis, foliis lineari-elongatis acutis, floribus urceolatis distincta.

Suffrutex 25 cm. altus; caulis erectus, superne ramosus, ramuli patule-erecti, rigidi, profunde sulcati, costis numerosis. *Folia* linearia, acuta, carinata circiter 1 cm. longa, coriacea, demum in bases induratas persistentes desinentia. *Flores* solitarii, in axillis bractearum foliosarum dispositi, breviter pedicellati; bracteolae 2, 1.5 mm. longae. *Perianthium* urceolatum, 2.5 mm. longum, viride, segmentis 1.5 mm. longis triangulari-ovatis cucullatis paulo carnosius. *Antherae* filamentis aequilongae, 0.65 mm. longae. *Stylus* 1 mm. longus. *Fructus* albidus (fide Range), non visus.

GERMAN SOUTH WEST AFRICA. Kubub Mts., 1630 m. Range, 65.

1096. *Thesium fastigiatum*, A. W. Hill. [Santalaceae]; affine *T. unyikensi*, Engl., praecipue caulibus et foliis minute puberulis differt.

Suffrutex perennis, omnino minute puberulus; caudex lignosus, caulibus numerosis erectis, circiter 30 cm. altis sulcatis ramulis fastigiatis 3–5 cm. longis dense obtectis. *Folia* caulina ovata vel elliptico-lanceolata, apiculata, circiter 5 mm. longa, folia ramulorum subulata, acuta vel acuminata, circiter 2 mm. longa, dorso et ad margines minute puberula vel subglabra. *Flores* ad apices ramulorum; bracteolae subulatae involucrum formantes. *Perianthium* 2.5 mm. longum, segmentis 1.25 mm. longis lineari-lanceolatis

cucullatis glabris marginibus inflexis. *Antherae* 0.5 mm. longae. *Stylus* 0.75 mm. longus. *Fructus* ovoideus, circiter 2 mm. longus, costis et reticulationibus conspicuis.

PORTUGUESE EAST AFRICA. On a ridge at the back of Mendwe Chujala-yala, *Johnson*, 316.

Archdeacon Johnson states that the roots of this plant are used for fish traps.

1097. *Thesium fenarium*, *A. W. Hill* [Santalaceae]; species *T. nigricanti*, Rendle, affinis caulibus gracilibus foliis et floribus minoribus antheris majoribus praecipue differt.

Herba vel suffrutex perennis; rhizoma gracile horizontale; caules erecti, numerosi, 20–30 cm. vel ultra alti, graciles, ramosissimi, profunde sulcati. *Folia* prope basin ovato-lanceolata, subacuta, carinata, 3–5 mm. longa, superne linearia, acuta, patentia, 5 mm. longa. *Flores* pauci, singuli, vel in cymas axillares producti; bracteae foliosae, partim pedunculis adnatae; pedunculi plus minusve 5 mm. longi; bracteolae 2, flores plus minusve aequantes. *Perianthium* 2.5 mm. longum, segmentis 0.75 mm. longis ovatis subacutis prope basin margine hirsutis. *Antherae* filamenta aequantes, 0.5 mm. longae. *Stylus* 0.75 mm. longus. *Fructus* ovoideus, 3 mm. longus, costis 5 primariis conspicuis, intermediis et reticulationibus inconspicuis.

NYASALAND. *Buchanan*, 1357 partim, 104; Mount Sotchi, *Scott Elliot*, 8541.

1098. *Thesium filipes*, *A. W. Hill* [Santalaceae]; *T. Stuhlmannii*, Engl., affine ramis filiformibus elongatis parciissime ramosis, inflorescentiis paucifloribus differt.

Herba vel suffrutex annua (?), e rhizomate ramosa; caules erecti, filiformes, tenaces, integri vel rarissime ramosi, 60–75 cm. alti, quadrangulares, sulcati. *Folia* minuta, squamiformia, distantia. *Flores* axillares, 1–3 in spicam terminalem dispositi; bracteolae numerosae, imbricatae, ovatae, acutae, carinatae, margine membranaceo-fimbriatae. *Perianthium* 2 mm. longum, segmentis 1.5–1.75 mm. longis linearibus acutis marginibus paulo inflexis hirsutis. *Antherae* filamentis 1 mm. longis, loculis 0.5 mm. longis. *Stylus* 1–1.5 mm. longus. *Fructus* non visus.

TROPICAL AFRICA. Congo: Dola, *R. Schlechter*, 12810.

A long wiry plant with flowers very similar to those of *T. Stuhlmannii*.

1099. *Thesium fimbriatum*, *A. W. Hill* [Santalaceae]; affine *T. Stuhlmannii*, Engl., sed ramulis numerosis gracilioribus, bracteis ovatis acuminatis ciliatis, segmentis perianthii lineari-ellipticis differt.

Herba annua (?); caulis erectus, 22–30 cm. altus, superne dense ramosus, caule et ramis angulatis sulcatis ramulis gracilibus fastigiatis. *Folia* pauca, squamiformia, plus minusve compressa. *Inflorescentiae* ramulis foliosis axillaribus dispositae, plus minusve congestae; bracteae et bracteolae 3–3.5 mm. longae, late ovatae, acuminatae, carinatae, marginibus fimbriatis vel ciliatis. *Perianthium* 3.5 mm. longum, segmentis 2.5 mm. longis lineari-ellipticis marginibus inflexis ciliatis. *Filamenta* 1.5 mm. longa, antherae

0.35–0.4 mm. longae. *Stylus* 2.5 mm. longus; stigmatē capitato *Fructus* globoso-ovoideus, circiter 1.5 mm. longus, costis 10 vel pluribus conspicuis.

NYASALAND. Between Kondowe and Karonga, 610–1830 m., *Whyte*, 321 partim.

1100. *Thesium fulvum*, *A. W. Hill* [Santalaceae]; *T. cinero*, *A. W. Hill*, simile sed habitu ramis paucioribus robustioribus folisque ovatis distinguendum.

Suffrutex perennis (?), omnino pilosis fuscis obtectus, caules erecti, sulcati, 25–38 cm. alti, ramulis lateralibus 2–10 cm. longis. *Folia* plus minusve distantia, versus basin ovato-lanceolata, acuta vel subacuta, superne subulata, acuta vel acuminata, 2–1 mm. longa, dorso pilosa. *Flores* terminales pedunculo elongato nudo suffulti vel aliquanto in ramulis foliosis laterales, bracteolis circiter 1 mm. longis ovatis acuminatis pilosis involucri formantibus. *Perianthium* 1.25 mm. longum, segmentis 0.75 mm. longis linearibus subacutis marginibus inflexis dorso pilosis. *Antherae* 0.35 mm. longae. *Stylus* circiter 1 mm. longus. *Fructus* globosus, pilosus, 1.5 mm. diametro, costis et reticulationibus conspicuis.

NORTH CENTRAL AFRICA. Eastern Chari: Ndelli, *Chevalier*, 7672.

1101. *Thesium fuscum*, *A. W. Hill* [Santalaceae]; species distincta caulibus cylindricis fuscis minute pilosis fructibus multi-costatis immaturis aurantiaco-brunneis.

Suffrutex, caulis erectus, superne multiramulus, circiter 30 cm. altus, cylindricus, minute pilosus, fuscus, rami paulo sulcati. *Folia* subulata, acuta, 1.75–2 mm. longa, dorso minute pilosa. *Flores* in inflorescentias axillares breves, bracteis et bracteolis imbricatis obtectis dispositi; bracteolae late ovatae, acuminatae, 2 mm. longae, pilosae. *Perianthium* 3 mm. longum, extra hirsutum, segmentis 1.5 mm. longis elliptico-ovatis cucullatis glabris marginibus inflexis. *Antherae* filamenta aequantes, 0.65 mm. longae. *Stylus* 2–2.5 mm. longus. *Fructus* globoso-ovoideus, minute pilosus, immaturus, in sicco aurantiaco-brunneus, 2.5 mm. longus, 2 mm. latus, costis conspicuis 12 vel ob venas intercostales parallele dispositas pluribus.

ANGOLA. *Gossweiler*, 4209, B (Herb. Mus. Brit.).

1102. *Thesium gracile*, *A. W. Hill* [Santalaceae]; species *T. Schweinfurthii*, Engl., et *T. Goetzeano*, Engl., affinis sed foliis et bracteolis minoribus, floribus in cymas sympodiales dispositis praecipue differt.

Suffrutex, caules numerosi, erecti, superne ramosi, 12–30 cm. alti, rami elongati, foliosi, angulati et sulcati. *Folia* linearia vel lineari-lanceolata, acuta, 1–1.4 cm. longa, apice colore destituta. *Inflorescentia* sympodiali-cymosa, axillaris, ramosa, compacta; bracteae ellipticae, vel lanceolato-subulatae, acutae, carinatae, plus minusve pedunculis adnatae; bracteolae 2, floribus breviores. *Perianthium* albidum vel pallide luteum, circiter 1.75 mm. longum, segmentis 1 mm. longis ovato-deltaeideis cucullatis marginibus inflexis apice barbatis. *Antherae* filamentis aequilongae, vix 0.25 mm. longae. *Stylus* 0.25 mm. longus; stigmatē dilatato. *Fructus* globoso-ovoideus, circiter 2 mm. diametro, costis conspicuis.

RHODESIA. Sebakwe, 1220 m., *Eyles*, 85. PORTUGUESE EAST AFRICA. Gazaland: Umswirizwi flats, 335 m., *Swynnerton*, 310; MOZAMBIQUE. Zonoe Manica, 760 m., *Johnson*, 255.

1103. *Thesium longirostre*, *Schlechter* MS. in Herb. Berol. [Santalaceae]; species caulibus et foliis papilloso-pilosis floribus et fructibus grandibus distincta.

Suffrutex rhizomate crasso; caules numerosi, plus minusve erecti vel prostrati, superne ramosi, 20–30 cm. longi, profunde sulcati, costis acutis papilloso-pilosis. *Folia* lineari-lanceolata, circiter 1 cm. longa, acuta, carinata, marginibus membranaceis et carina dense papilloso-pilosis. *Flores* sessiles, solitarii, in axillis bractearum dispositi; bracteolae 2, circiter 4 mm. longae. *Perianthium* cylindricum, 5·5 mm. longum, segmentis 3·5 mm. longis lanceolatis acutis cucullatis apice barbatis, margine membranaceo papilloso. *Antherae* 1 mm. longae; filamentis 0·75 mm. longis. *Stylus* 2 mm. longus. *Fructus* ovoideus, 3·5 mm. longus, glaber, costis 10 distinctis instructus.

GERMAN SOUTH-WEST AFRICA. Auas mountains, *Dinter*, 1504.

1104. *Thesium masukense*, *Baker* [Santalaceae]; *T. Stuhlmannii*, Engl., in habitu simile perianthio minuto praecipue differt.

Annum (?), caules graciles, erecti, glabri, sulcati, inferne paulo alati, circiter 30 cm. alti. *Folia* squamiformia, subulata, acuta, carinata, circiter 1 mm. longa. *Flores* in spicas axillares compressas vel in spicas terminales dispositi; bractee et bracteolae circiter 2 mm. longae, anguste ovatae, acutae, carinatae, marginibus membranaceis. *Perianthium* circiter 1·25 mm. longum, segmentis 0·75 mm. longis ovatis subacutis cucullatis glabris. *Antherae* 0·2 mm. longae. *Stylus* 0·5 mm. longus. *Fructus* globosus, circiter 1·5 mm. in diametro, costis et reticulationibus conspicuis.

NYASALAND. Masuku plateau, 1980–2140 m., *Whyte*.

1105. *Thesium mukense*, *A. W. Hill* [Santalaceae]; species *T. gracili*, *A. W. Hill*, affinis sed foliis numerosis elongatis, perianthio et antheris majoribus differt.

Suffrutex 15–50 cm. altus; caules numerosi, erecti, robusti, ramosi; rami adscendentes, 10–18 cm. alti, profunde sulcati. *Folia* numerosa, caduca, in partibus vetustioribus, 1·5–2·5 mm. longa, linearia, acuta, plus minusve erecta. *Inflorescentiae* pauciflorae, racemos terminales breves formantes. *Flores* in axillis bractearum dispositae, pedicellis bracteis ex parte adnatis; bractee foliosae, 4–6 mm. longae, bracteolae 2, florem aequantes, vel eo breviores. *Perianthium* 2–2·5 mm. longum, urceolatum, segmentis 1–1·5 mm. longis ovato-deltoideis subacutis cucullatis apice et ad margines versus apicem dense barbatis. *Antherae* filamentis aequilongae, 0·5 mm. longae, antherae subpendulosae. *Stylus* 0·5 mm. longus. *Fructus* ignotus.

BRITISH EAST AFRICA. Muka, *Kässner*, 943; Ukamba, 1525–1830 m., *Scott Elliot*, 6407. NYASALAND. *Buchanan*, 45.

1106. *Thesium myriocladum*, *Baker* [Santalaceae]; species *T. doloensi*, *Pilger*, in siccitate nigricanti similis sed pedunculis brevibus foliis et bracteis anguste subulatis glabris acuminatis praecipue differt.

Suffrutex in siccitate nigricans; caules lignosi, rigidi, multiramosi, ramulis brevibus patentibus numerosis 2–6 mm. longis instructi. *Folia* lanceolata, subulata, 1·5 mm. longa, squamiformia. *Flores* solitarii, ad apices pedunculorum foliosorum dispositi; bracteis et bracteolis lineari-lanceolatis acuminatis circiter 1 mm. longis involucrum formantibus marginibus minute ciliolatis. *Perianthium* 2 mm. longum, segmentis ovato-lanceolatis 1·25 mm. longis glabris cucullatis marginibus inflexis. *Antherae* 0·5 mm. longae. *Stylus* 1·25 mm. longus. *Fructus* ignotus.

RHODESIA. Batoka highlands, *Kirk*.

1107. *Thesium palliolatum*, *A. W. Hill* [Santalaceae]; species *T. mukensi*, *A. W. Hill*, affinis sed cucullo elongato dense barbato segmentis perianthii et antheris minutis distinguenda.

Suffrutex vel herba, circiter 20 cm. alta, superne leviter ramosa; caulis profunde sulcatus, laxis. *Folia* linearia, carinata, 0·8–1·2 cm. longa, acuta. *Flores* brevi-pedunculata, singuli vel in cymas 3-floras dispositi, inflorescentias laxas terminales formantes; bracteae lineares, concavae, acutae, 8 mm. longae, pedunculis circiter 4 mm. adnatae, bracteolae 2, 2·5 mm. longae. *Perianthium* 2·5 mm. longum, campanulatum, segmentis 1·5 mm. longis apice cucullo circiter 0·5 mm. longo basi dense barbato instructis. *Filamenta* 0·4 mm. longa; antherae 0·25 mm. longae. *Stylus* 0·75 mm. longus. *Fructus* globosus, 1·5 mm. diametro, costis distinctis reticulationibus tenuibus instructus.

PORTUGUESE EAST AFRICA. Lower Zambesi: Sena, *Kirk*.

1108. *Thesium pilosum*, *A. W. Hill* [Santalaceae]; species *T. lycopodioidi*, Gilg, et *T. striguloso*, Welw., affinis sed foliis floribusque majoribus antheris longis differt.

Suffrutex perennis, humilis, rhizomate lignoso; caules erecti, simplices vel prope basin ramosi, 6–10 cm. alti, dense pilosi. *Folia* triangulari-ovata, acuminata, 4–5 mm. longa, dorso et ad margines pilosa, paulo amplexicaulia. *Flores* subsessiles vel breviter pedunculati, axillares; bracteolae lineari-lanceolatae, acuminatae, 3 mm. longae, involucrum formantes. *Perianthium* 2·5 mm. longum, extra hirsutum, segmentis circiter 1·75 mm. longis anguste ovato-lanceolatis cucullatis marginibus membranaceis paulo inflexis. *Filamenta* 0·5 mm. longa; antherae 0·75 mm. longae. *Stylus* 2 mm. longus. *Fructus* immaturus.

ANGOLA. *Gossweiler*, 4209 C (Herb. Mus. Brit.).

1109. *Thesium resedoides*, *A. W. Hill* [Santalaceae]; species distincta speciebus segmentis perianthii barbatis affinis, floribus subsessilibus in spicas terminales vel in cymas 3-floras dispositis.

Suffrutex perennis, humilis; caudex lignosus; caules erecti, 15–20 cm. alti, ramis patentibus 5–10 cm. longis angulatis sulcatis. *Folia* distantia, patentia, 6–8 mm. longa, subulata, acuta, apice decolorata. *Inflorescentia* spicata vel racemosa, floribus singulis subsessilibus vel in cymas 3-floras dispositis; bracteae lanceolatae, acutae, floribus aequilongae vel longiores, saepius pedunculo adnatae; bracteolae 2, floribus breviores. *Perianthium* album, circiter 2·5 mm. longum, segmentis elliptico-ovatis obtusis 1·5 mm. longis cucullatis marginibus versus apicem dense barbatis. *Filamenta* 0·4 mm. longa; antherae 0·65 mm. longae, dorso dense hirsutae. *Stylus* 0·75 mm.

longus. *Fructus* ovoideus 3 mm. longus, 2 mm. latus, immaturus, costis inconspicuis. *Thesium Welwitschii*, Baum in Kunene-Zambesi Expedition, p. 230, non Hiern, Welw. Cat. Afr. Pl. Pt. iv. p. 938.

ANGOLA. By the river Chitanda, on sandy ground between quartz rocks, *Baum*, 152.

1110. *Thesium tamariscinum*, *A. W. Hill* [Santalaceae]; inter species involuero bracteolarum instructas ramulis tamarisciformibus tenuibus foliis reductis distincta.

Suffrutex perennis (?), caules prostrati vel suberecti, 10–50 cm. longi, sulcati, multiramosi; rami glabri, flexuosi, tenues vel filiformes. *Folia* squamiformia, ovata, acuta, plus minusve 1 mm. longa, distantia. *Flores* singuli, ad apices ramulorum breviorum foliosorum 0.5–3 mm. longorum dispositi; bracteolae circiter 0.75 mm. longae, ovatae, acutae vel acuminatae, involucri parvum formantes. *Perianthium* 1.5 mm. longum, segmentis 1 mm. longis anguste ovatis cucullatis marginibus superne inflexis ad basin minute ciliolatis. *Antherae* filamentis aequilongae, 0.25 mm. longae. *Stylus* 1 mm. longus; stigmatibus capitato. *Fructus* globoso-ovoides, circiter 2 mm. longus, costis primariis et reticulationibus distinctis instructus.

NYASALAND. Between Kondowe and Karonga, 610–1830 m., *Whyte*; Nyika plateau, 1830–2135 m., *Whyte*, 168.

XXVIII.—THE HONGKONG HERBARIUM.

S. T. DUNN.

The herbarium, library, and offices of the Botanical and Forestry Department of the Hongkong Government are contained in a charmingly situated building overlooking the Botanic Gardens and the harbour. The library and herbarium are accommodated in a fine room which occupies about half the ground floor, and is well lighted during the day by six large windows opening to the ground and by electric light at night.

Owing to the expense and difficulty of preserving books and dried plants in that climate, the range of literature is confined to subjects absolutely necessary to the work of the department, and the plant collections represent only the flora of China and contiguous countries, and such species as have been cultivated locally. As in other herbaria in the tropics, the two enemies, damp and insects, have to be combated without intermission, the former by artificial drying, the latter by poisoning the specimens with corrosive sublimate. The room is dried at night during the prevalence of the hot moist conditions of the south-west monsoon by means of a large gas stove, and the whole collection is gone over once a year to ensure that no trace of mould or of insects is overlooked. The books are preserved from the attacks of cockroaches (which demolish the bindings of any not specially protected) by the application, every four or five years, of a special varnish.

The work entailed in these operations is done by two Chinese herbarium assistants, whose sole duty it is to prepare and preserve

the collections. The Chinese are eminently suited to such duties ; they like the work, and can soon be trained to handle specimens with care. In the present organization of the herbarium, the point aimed at is to ensure that these men take all the work, not requiring botanical knowledge, off the hands of the Superintendent and Assistant Superintendent, the only European officers of the department, whose time is chiefly devoted to higher executive duties. The principal difficulty in utilizing Chinese in this way lies in their inability to grasp our system of classification, or to become accustomed to the Latin names of plants. The latter difficulty is aggravated by the strangeness of the, to them, foreign handwriting in which these names are written, often hastily, on the labels. These troubles once overcome, the Chinaman becomes a very useful man in the herbarium, and the following plan has been devised to meet the case. All generic names are immediately translated by the assistants into numerals, and are, at least during the first years of training, spoken of and thought of in their numerical form. For this purpose the collection has been conspicuously numbered with large printed numbers ; each sheet and species cover has its number and the numerical contents of each shelf and each cabinet are indicated clearly on the outside. The numbers are, for flowering plants, those given to the natural orders and genera in Bentham and Hooker's *Genera Plantarum*. Each *Clematis* sheet, for example, is stamped 1-1 and each *Carex* 199-61. A printed alphabetical list of all the genera in the herbarium followed by their proper numbers, is pasted inside each cabinet door. The numbers of Cryptogamic genera follow on from the last numbers of the *Genera Plantarum*, and have been arranged in the same sequence as that adopted in Kew publications.

The assistants, having received a collection generically named, can by the above device number it, classify it and poison it. They can then match the specimens with the herbarium sheets, taking out, and submitting in batches for verification, the plants which they believe to be conspecific. When the correct name has thus been obtained they proceed to copy the labels, set aside duplicates, enter in the plant lists, and finally, if required, lay into the herbarium. The numerical system makes it possible for specimens required in other parts of the building to be quickly found and brought by the assistants, on quotation of the number, and it practically obviates all mistakes in the replacing of the plants in their right positions on being returned to the herbarium. The writer has also found it convenient, when making large collections in the interior, to carry a list of the genera and numbers so as to add the latter to the labels, which enables the Chinese driers to keep the dried plants in systematic order for reference.

The idea of forming a herbarium in connection with the public gardens, then a branch of the Surveyor General's department under the charge of Ford, was first referred to in the official report of the latter dated 31st December, 1872. During the 30 years, which had elapsed since the occupation of the island by the British, a considerable amount of collecting had been done, such well known botanists as Fortune, Hinds, Harland, Champion, and,

above all, Hance, having at various times explored the neighbourhood, but their collections had all been sent out of the colony. Hance, however, who was at that time British Vice-Consul at Whampoa, had his herbarium, the most important collection of Chinese plants then in existence, at his official residence on Dane's Island, some 80 miles from the British colony, and it was doubtless through making full use of his herbarium, library, and advice, that Ford was able in 1878 to report that a public herbarium was in process of formation in Hongkong. But if, in this sense, Ford's herbarium was the daughter of Hance's, it is equally certain that it soon attracted the attention of Kew, with which establishment it has been almost from the beginning in constant communication. The botanical development of the department received considerable official help through the good offices of Sir Joseph Hooker, then Director of the Royal Botanic Gardens, Kew, who in an official memorandum, dated Feb. 1st, 1878, described Hongkong as "the key to the botanical position as regards the Chinese Empire," and during the next few years the building up of the herbarium, now accommodated in more adequate quarters, was pushed forward with energy. The co-operation of Sampson, who still lived in Canton, and of other collectors was secured.

In 1882 the appointment of an English assistant enabled Ford to leave Hongkong on the first of a series of expeditions into the interior of China to investigate the flora and the vegetable economic products, which were up to that time practically unknown to the outside world, except as articles of commerce. This journey was taken at the instance of Sir Joseph Hooker to endeavour to trace the botanical origin of *Cassia Lignea*, one of the most important products of South China. Ford proceeded up the West River to the Kwangtung Cassia districts, and completed a very thorough piece of work to the satisfaction of the Government, who printed and circulated an account of the expedition and its economic results. The collection of wild plants made along the route was added to the herbarium. Another important contribution to our knowledge of Chinese commercial products was made about this time by Ford by the procuring from South Kwangtung and the successful cultivation of Star Anise. In 1883, in company with Faber, he made a botanical exploration of the Lo Fou Shan, 50 miles from Canton, and returned with considerable living and dried collections, containing several plants new to science.

Meanwhile the herbarium collection was being increased by the contributions of collectors from other parts of China, such as B. C. Henry from Hainan, Watters (and Ford) from Formosa, and Faber from Ningpo, while Ford and his assistant, Westland, made frequent short expeditions in the intervals of their more pressing work and discovered many new and interesting species in the neighbourhood of Hongkong. Among other things, Ford succeeded in determining the botanical origin of the important Fan Palm and of Chinese Ginger. In 1886, Chinese Botany suffered an irreparable loss by the death of Hance, and Ford not only found himself deprived of his constant help and advice, but also of the possibility of consulting his excellent herbarium and library, which were before long sold and removed to England.

In 1887 considerable collections were made on the North River and Lienchow River, and the herbarium, which was now assuming formidable proportions, was removed shortly afterwards (1892) into the larger premises which it now occupies. The 1887 expedition seems to have been the last until recent years made by the department, but collections from other sources continued to pour in. Bodinier and Bourne were among the chief contributors, but by far the most important collections were presented by A. Henry from Formosa, Szechuan and Yunnan, 3041 specimens in all. In 1899 the New Territories were taken over by the Colony, and the great extension of forestry work, which immediately fell on the department, precluded Ford from devoting much more time to the herbarium up to the date of his retirement in 1903.

When the writer took over the superintendence of the department in that year, there were, therefore, large accumulations of material awaiting examination and incorporation in the herbarium, and it became evident that some plan would have to be devised to cope with them. This was accomplished by the appointment at the commencement of the following year of the two herbarium assistants and the reorganization of the work referred to above.

During the last seven years the most important presentations to the herbarium have been a further set of Henry's Yunnan plants from Kew, Ningpo plants from Barchet, Szechuanese plants from Crosfield, and small collections made by Light in Hunan, and Matthew in Korea, Weihaiwei and Kwangtung. Large collections have been purchased from Wilson (W. China) and Forrest (Salween Valley). The writer has added small collections, made during intervals of leave in Shantung, Korea and Formosa, while Tutchet (Assistant Superintendent) has continued his indefatigable and fruitful explorations of the flora of the Colony, adding year after year numerous novelties to its list.* Official expeditions have been made by native collectors to Hoifung (N.E. Kwangtung) and Sze-tse Shan (S.E. Kwangtung) while more elaborate explorations of Central Fokien and the Swatow Hinterland (Kwangtung) have been conducted by the writer. The Fokien expedition, of which an account was published in the journal of the Linnean Society, xxxviii. (1908) 350-73, was probably the most productive contribution yet made by the department to systematic botany, 5000 specimens being brought home, including types of 50 new species. Not only the Hongkong herbarium but several other large herbaria will eventually be well provided from this collection with material representing the flora of this little-explored province.

The principal economic additions to the collection during this last period have been the type specimens of all the Chinese plant products of which Hongkong is a market. Samples of each, bearing similar numbers, were sent to the Imperial Institute, where most of them may be seen in the Hongkong Court. This should obviate to some extent the frequent misunderstandings which occur when enquiries about Chinese products are made from Hongkong or from London, owing to the indefiniteness of the Chinese names.

* See Tutchet in Journ. Linn. Soc. xxxvii. (1905) 58-70, and Dunn in Journ. of Bot. 1907-1909.

Owing to the great distance of Hongkong from Europe and America, there is not much evidence of the work of botanists outside the department on the herbarium sheets, but Dr. Hans Hallier has recently revised the *Convolvulaceae*, Col. Prain the *Dalbergias*, Copeland the Ferns, and Sir Joseph Hooker the Balsams. The large series of Balsams, bearing on nearly every sheet the drawings and handwriting of that veteran botanist, forms one of the principal ornaments of the collection.

Besides the journal of work done in the herbarium, a consecutively numbered list is kept of all plants added to the collection, not previously numbered; this includes all the plants collected by the staff, and their labels now invariably bear Hongkong Herbarium numbers and not personal ones. A record is also kept up to date in tabular form of the provincial distribution of each species of the Chinese flora, indications being inserted in their proper places as new provinces are added to the area of the species, on the evidence of specimens or of printed records. All such specimens are preserved in the herbarium, so that it probably contains, as indeed it ought to do, the most complete series of Chinese plants in existence.

XXIX.—DECADES KEWENSES.

PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM.

DECAS LVII.

561. *Micromeles caloneura*, Stapf [Rosaceae-Pomeae]; species nova ex affinitate *M. Schwerinii*, C. K. Schneid., foliis infra viridibus subglabris serratura minus inaequali et minus acuta, inflorescentia multo minus villosa, floribus majoribus, sepalis latis obtusis, stylis 5, fructibus majoribus distincta.

Arbor mediocris vel *frutex*; rami glabri, cortice subnitido nigro-castaneo obtecti, parce lenticellati, tandem transverse rugosi. *Gemmae* hibernantes ovoidei, extus glabri; perulae intus fulvo-pilosae et ex axillis pilis fulvis stipatae. *Folia* elliptico-oblonga vel obovato-oblonga, acuta vel rarius acuminata vel interdum obtusiuscula, basi subacuta, duplicato-serrato-crenata, crenis nervos laterales primarios recipientibus quam caeteris plerumque majoribus 6–9 cm. longa, 3–4.5 cm. lata, firme herbacea, decidua, supra glaberrima, demum saturate viridia, infra pallida, secundum nervos saltem ad eorum axillas parce villosula, nervis lateralibus subrectis eximie parallelis utrinque 10–12 supra eleganter impressis infra prominentibus, venis transversis areolisque tenuissimis; petioli 6 mm. longi, primo laxè pilosi, mox glabri, anguste canaliculati; stipulae subfiliformes, 6–8 mm. longae, pilosae, mox deciduae. *Flores* plerumque in ramis abbreviatis in corymbis multifloros dispositi 6 mm. diametro; ramuli et pedicelli et bracteae caducissimae, filiformes, laxè villosulae. *Receptaculum* turbinatum, pilosulum. *Sepala* late ovata, obtusa, vix 2 mm. longa, villosula. *Petala* alba, late obovata, 5 mm. longa; stamina circa 20; antherae violaceo-purpureae. *Styli* 5, inferne connata. *Fructus* globoso-pyriformis, brunneus, lenticellatus, 8–10 mm. longus.

CHINA. Szechuan : Northern Wushan, *Henry*, 7027 ; in woods, at 2400 m. above sea-level, *Wilson*, 3496a.

This well marked species has recently flowered in the Coombe Wood nursery of Messrs. J. Veitch & Sons, on whose behalf seeds were collected in Western China by Mr. E. H. Wilson.

562. *Diospyros* (*Ermellinus*) *strigosa*, *Hemsl.* [Ebenaceae] ; species *D. erianthae*, Champ., proxima, differt imprimis foliis basi cordatis et venis primariis numerosioribus supra impressis.

Rami juniores pilis patentibus rufescentibus vestiti, internodiis circiter 1 cm. longis. *Folia* subdisticha, brevissime petiolata, vix coriacea, oblongo-lanceolata vel interdum ovato-lanceolata, raro obovato-oblonga, 5-10 cm. longa, 2-5 cm. lata, acuta, basi leviter cordata, rarius rotundata, nunquam cuneata, supra glabra vel cito glabrescentia, subtus ferrugineo-pubescentia, venis primariis lateralibus utrinque circiter 7 subtus elevatis. *Flores* tetrameri, 1-1.2 cm. longi, utriusque sexus similes, axillares, solitarii, brevissime pedunculati ; pedunculi calycesque bracteolis compluribus (circiter 6-8) sursum gradatim majoribus 1.5-6 mm. longis rigidis aretissime imbricatis cincti. *Calyx* densissime strigoso-setosus, fere ad basin 4-partitus ; segmenta lanceolata, circiter 6 mm. longa, corollae tubum fere aequantia et illi arcte appressa. *Corolla* hypocrateriformis, circiter 1 cm. longa, extus supra medium strigoso-setulosus, tubo apicem versus leviter constricto, lobis lanceolatis circiter 3 mm. longis. *Stamina* 12, inaequilonga, pistillodio filiformi. *Ovarium* strigilloso-pilosum, 4-loculare, loculis uniovulatis ; styli 2, breves. *Staminodia* nulla. *Fructus* nobis ignotus.

CHINA. Hainan, *Henry*, 8741.

563. *Duvalia sulcata*, *N. E. Brown* [Asclepiadaceae-Stapelieae] ; affinis *D. Corderoyi*, N. E. Br., sed caulibus 4-angulatis et corollae lobis 5-sulcatis facile distinguitur.

Caules decumbentes, 2.5-6.5 cm. longi, 4-angulati, 1.2-1.8 cm. (absque dentibus) crassi, glabri, albido-virescentes, purpureo-variegati, dentibus 6-10 mm. longis subulatis integris. *Flores* 1-3, subfasciculati. *Pedicelli* 2-2.8 cm. longi, 1.5 mm. crassi, patentes, glabri. *Sepala* 3 mm. longa, ovato-lanceolata, acuta, glabra. *Corolla* circa 4.5 cm. diametro, brunneo-rubra, annulo pilis longis pallide roseis dense vestito ; lobi 1.6-1.8 cm. longi, 1.2 cm. lati, patentes, ovati, acuti, convexi (nec replicati), 5-sulcati, apice rugulosi, glabri, basi pilis longis clavatis purpureis vibratilibus ciliati ; annulus 1.2-1.4 cm. diametro, circularis. *Corona exterior* circularis, plana, annulo subinclusa, purpurascens, annulo lutescente prope marginem instructa, glabra. *Coronae interioris* lobi 2 mm. longi, erecti, ovoidei, acuti, apice leviter incurvati, albi.

ARABIA. *Bent.*

Described from a living plant brought by the late Mr. Theodore Bent from South Arabia, which flowered at Kew in 1898 and 1899. Its nearest ally is *D. Corderoyi*, N. E. Br., a native of South Africa, from which it differs in its 4-angled, handsomely mottled stems, and in the corolla-lobes being merely convex, with 5 grooves on their inner face and not at all folded as in *D. Corderoyi*.

564. *Euphrasia linumae*, *Takeda* [Scrophulariaceae-Euphrasieae] ; ab *E. insigni*, Wettst., cui remote affinis, differt caule humiliore ad medium ramoso, foliis basin versus minus attenuatis, dentibus

acutis nec acuminatis, longitudine latitudinem in maximo minus duplo superante, spica densiore, floribus minoribus.

Caulis erectus vel ascendens, firmus, 15–20 cm. altus, fuscescens, pilis albidis crispulis reversis pubescens, ad medium ramosus, ramis paucis erectis vel erecto-patentibus suboppositis interdum iterum ramosis. *Folia caulina* infima non vidi, media ovalia, obtusata, utrinque dentibus obtusiusculis 2–3 raro 4, basi cuneata, superiora rhombeo-ovalia, acuta, basin versus cuneato-attenuata, utrinque dentibus 2–3 raro 4 acutis et non acuminatis; folia omnia glaberrima in speciminibus siccatis brunneo-nigrescentia. *Bracteae* dense imbricatae, suboppositae vel alternatae, latitudine folia caulina superantes, cuneato-flabellatae vel rhombeo-ovales, basin versus attenuatae, utrinque dentibus 2–3 rarius 4 acutis sed non acuminatis. *Spica* modice longa, densa. *Flores* breviter pedicellati. *Calyx* dentibus tubum aequantibus lanceolatis acutis in nervis setulosis margine hirsutis, fructifer vix accretus. *Corolla* magna, in dorso circiter 8–9 mm. longa, tubo denique calycem paullo superante, labio superiore bilobo, lobis reflexis leviter emarginatis, labio inferiore dilatato trilobo, lobis emarginatis; corollae color verosimiliter albidus, labio superiore caerulescente, labio inferiore macula lutea picto (? solum ex sicco), extus minute hirsuto. *Capsula* cuneata, circa 4·5–5 mm. longa, emarginata, calycem aequans vel brevior atque rarissime parum superans, margine pilis albidis paucis ciliata, ceterum glabra; seminibus in quoque loculo solum tribus.—*Euphrasia latifolia*, Iinuma, Sôroku Dzusetsu, xi, p. 67, non Pursh. Icon. *Iinuma, Sôroku Dzusetsu*, xi, r. 66 (*forma b.*).

Prostant formae duae: altera (a. *cuneata*, m.) foliis rhombeo-ovalibus basin versus valde cuneato-attenuatis, bracteis latoribus quam longis, calyce 4–4·5 mm. longo; altera (b. *latifolia*, m.) foliis late ovatis, bracteis cuneato-flabellatis, latitudine longitudinem superante, calyce 3·5–4 mm. longo.

JAPAN. Central Nippon: on Mt. Ibuki, prov. Ômi, *R. Yatabe*, 1. viii. 1881 (*forma b.*); *T. Makino*, x. 1905 (*formae a et b.*).

This species is named in compliment to Yokusai Iinuma, the author of the famous Sôroku Dzusetsu, who described in his works one of the Japanese species of *Euphrasia* for the first time.

565. *Euphrasia idzuensis*, *Takeda* [Scrophulariaceae-Euphrasieae]; statura *E. multifoliae*, Wettst., similis, a qua foliis ovatis nec elliptico-lanceolatis, floribus majoribus, calyce post anthesin accreto, capsula non multo brevior facile distinguitur.

Caulis erectus, firmus, 15–45 cm. (vulgo circa 25 cm.) altus, nigro-fuscescens, pilis albidis crispulis reversis eglandulosis pubescens, ad et supra medium ramosus, in parte inferiore foliis deciduis mox denudatus, ramis erecto-patentibus vel suberectis oppositis numerosis, saepius hinc inde iterum ramosis. *Folia caulina* infima cuneiformia vel ovato-cuneata, obtusa, utrinque dentibus 1–2 obtusis, inferiora ovata, basi cuneata vel subrotundata, utrinque dentibus 3 obtusis, media late ovata, acutiuscula, basi rotundata, utrinque dentibus 3–5 acutiusculis, si dentes 5 adsunt dente infimo minimo, superiora ovata, acuta, basi cuneata, interdum subrotundata, utrinque dentibus 3–4 acutis acutissimisve; folia omnia opposita, glabra, margine solum setulosa, in speciminibus siccatis atroviridia. *Bracteae* foliis caulinis similes, ovales vel rhombeo-ovales, acutae, utrinque dentibus

tribus acutissimis sed non aristatis. *Spica* pro ramorum longitudinis ratione brevis. *Flores* magni, subsessiles. *Calyx* dentibus tubum aequantibus lanceolatis acutis, in nervis et margine setulosis, post anthesin modice accretus. *Corolla* in dorso 7-8 mm. interdum fere 9 mm. longa, tubo calycem paulo superante, labio superiore bilobo, lobis reflexis plus minusve emarginatis interdum subintegris, labio inferiore late trilobo, lobis emarginatis, tota alba, labio superiore striis purpureis extus apiceque hirsuto, labio inferiore maculis luteis picto in medio hirsuto. *Capsula* cuneata, ad 5 mm. longa, emarginata, calycem subaequans, margine pilis albidis longe ciliata, ceterum glabra, seminibus in quoque loculo 5-6.

JAPAN. Central Nippon: Prov. Idzu; Karuizawatôge, *H. Takeda*, 13 .x. 1900; Shuzenji, *T. Yamanaka*, 28. viii. 1905; Iwatoyama, *H. Takeda*, 12 .x. 1905.

This species has been collected only in the province of Idzu. The first specimens, which I found in 1900 on the pass Karuizawatôge between Atami and Dâiba, induced me to study the species of this genus. The flower of my plant is pure white in colour with a yellow mark in the centre, and small spots of the same colour at the base of the lower lip, the upper lip having stripes of purple colour.

566. *Euphrasia Makinoi*, *Takeda* [Scrophulariaceae-Euphrasieae]; a *E. idzuensis*, *Takeda*, cui arcte affinis, bracteis late ovatis nec paucato-ovatis, calyce et capsula angustiore pauloque longiore, seminibus paucioribus, floribus minoribus dignoscitur.

Caulis ascendens vel erectus, 17-28 cm. altus, brunneo-fuscescens, pilis albidis crispulis reversis eglandulosis pubescens, ad medium ramosus, in parte inferiore foliis deciduis mox denudatus, ramis erecto-patentibus curvatis (an semper?) oppositis. *Folia caulina* inferiora mihi ignota, media et superiora ovata, acuta, basi rotundato-cuneata vel cuneata, utrinque dentibus 3-4 acutissimis sed non aristatis; folia omnia opposita, glabra, margine solum setulosa, in sicco nigrescenti-viridia. *Bractae* late ovatae, acutae, basi rotundatae, utrinque dentibus tribus acuminatis sed non aristatis. *Spica* modice longa, laxiuscula. *Flores* parvi, breviter pedicellati. *Calyx* dentibus tubum aequantibus oblongo-lanceolatis acuminatis in nervis margineque setulosis, post anthesin paululum accretus. *Corolla* in dorso 7 mm. longa, tubo calycem fere aequante, labio superiore bilobo extus hirsuto, lobis reflexis emarginatis, labio inferiore trilobo lobis emarginatis; corollae color ex sicco albidus. *Capsula* anguste cuneata, circiter 5.5 mm. longa, leviter emarginata, calyce paulo brevior, margine pilis albidis ciliata, ceterum glabra, seminibus in quoque loculo 4.—*Euphrasia officinalis* var. *vulgaris*, Makino, in Tôkyô Bot. Mag. x (1896), p. 108, pro parte, non Benth.

JAPAN. Shikoku: Prov. Tosa, *T. Makino*, ix. 1891.

567. *Utricularia Cavalerii*, *Stapf* [Lentibulariaceae]; affinis *U. racemosae*, Wall., a cuius formis tenuibus differt bracteis obtusiusculis multo minus descendens, capsula ellipsoideo-globosa vel ellipsoidea et imprimis seminibus eximie spinuloso-muricatis.

Herba tenuis, 8-15 cm. alta. *Caules* cum foliorum rosulis e rhizomate tenuissimo applanato orti, filiformes, simplices, exsiccando nigrescentes, ima basi stolones et rhizoidea laevia tenuia edentes. *Folia* rosularum pauca, spatulata, sensim in petiolum attenuata et eo incluso ad 4 vel 5 mm. longa, obtusa; caulina 2-3, squamiformia,

subdeltoidea, medio vel sub medio affixa, utrinque vel basi saltem obtusa, circiter 1 mm. longa, hyalina. *Utriculi* e stolonibus rhizoideis vel foliis orti, stipitati, globosi, 0.5–0.75 mm. diametro, labio superiore glanduloso-fimbriato lato. *Bractee* foliis caulinis similes, nisi magis oblongae, circiter 1.5 mm. longae; bracteolae subulatae, 1 mm. vel ultra longae; pedicelli 1–1.75 mm. longi, tenues. *Calyx* labiis late ovatis obtusis, inferiore majore sub anthesi ad 2 mm. longo saepe emarginato. *Corolla* violacea; labium superum anguste oblongum, vix 2 mm. longum, erectum; labium inferum ore ascendente late subquadratum, emarginatum, ad 3 mm. longum; calcar fere rectum, descendens, subobtusum, 4 mm. longum, subinflatum. *Staminum* filamenta linearia. *Stylus* distinctus, ultra 0.5 mm. longus. *Capsula* ellipsoidea vel ellipsoidea-globosa, 2.5 mm. longa, e calyce paululo exserta. *Semina* ellipsoidea, 0.25 mm. longa, eximie spinuloso-muriculata, spinulis obtusis magis minusve seriatim dispositis.

CENTRAL CHINA. Kwei Chou: Pin-fa, *Cavalerie*, 811 (comm. A. Lévillé).

568. *Tabebuia stenocalyx*, *Sprague et Stapf* (Bignoniaceae-Tecomeae]; species insignis calyce angusto, corollae tubo gracili ad $\frac{2}{3}$ cylindrico, ovulis in utroque loculo biseriatis.

Arbor procerior; ramuli novelli compressi, lepidoti, citissime glabrati, crebre lenticellati, vetustiores teretes, robusti cortice pallido obtecti. *Folia* elliptica, apice obtusissima vel rotundata, saepe leviter retusa, basi subacuta, 10–15 cm. longa, 7–10 cm. lata, coriacea, margine anguste recurva, costa subtus acute prominente, nervis lateralibus utrinque circiter 7 intermediis 1.7–2.5 cm. distantibus infra marginem arcuatim connexis reticulatione utrinque prominente; petioli robusti, 1–1.7 cm. longi, supra ad junctionem cum lamina glandula oblonga notati. *Inflorescentia* paniculata ramis plerisque bifloris rhachi ramisque compressis superne tenuiter lepidotis; bractee foliaceae, oblanceolatae vel sublineares, vel summae subulatae inferiores 1.5–3 cm. longae, 2.5–7 mm. latae; bracteolae e basi latiore magis minusve subulatae, ad 2 mm. longae; pedicelli 1–1.7 cm. longae. *Calyx* tubulosus, superne sensim dilatatus, dense lepidotus, superne immerso-glandulosus, 2–2.5 cm. longus, ad os 0.5–0.7 cm. latus, irregulariter 2–3-dentatus, uno latere ad 5–9 mm. fissus, dentibus latis obtusiusculis. *Corolla* alba, extus glabra; tubus 5–5.5 cm. longus, ad $\frac{2}{3}$ cylindricus 2–3 mm. latus, abhinc dilatatus ad os ad 12 mm. latus, intus supra stamina vittis papilloso-pubescentibus ad limbi sinus ascendentibus notatus; lobi late ovati, obtusi, ad 2 cm. longi, fere ad 1.5 cm. lati, supra papilloosi. *Stamina* circiter 18 mm. sub ore inserta, filamentis subaequalibus, 7.5 mm. longis; staminodium 3.5 mm. longum. *Discus* cupularis, crenulatus. *Ovarium* tenuiter lepidotum; ovula in utroque latere dissepimenti biseriata, ultra 30 pro serie, oblonga, horizontaliter affixa. *Fructus* ignotus.

TRINIDAD. Government House Grounds, *Broadway*, 2888.

A very distinct species which differs from those previously described in having only two rows of ovules in each cell. It may possibly represent a new genus, but until fruits are known it seems best to place it in *Tabebuia*.

There are specimens of an allied species in the Kew Herbarium from "Brazil, Hort. Kew" (Herb. Hook.), and from the Pomeroun

District of British Guiana, collected by im Thurn. This differs in the proportionately narrower leaves, cuneate at the base, and with more numerous lateral nerves.

569. *Gamogyne pulchra*, N. E. Brown [Aroideae-Philodendreae]; species nova affinis *G. Burbidgei*, N. E. Br., sed spatha kermesina, organis neutris (pistillodiis) basalibus, staminodiis nullis et stigmatibus rubris differt.

Herba perennis, acaulis, omnino glabra. *Foliorum* subrectorum petioli 5-9 cm. longi, teretes, faciebus canaliculati, basi breviter et late vaginati; laminae 3-17 cm. longae, 2-3.7 cm. latae, lanceolatae, acutae, basi cuneato-acutae, supra virides, subtus pallidiores. *Pedunculi* erecti, circa 14 cm. longi, teretes, rufo-brunnei. *Spatha* subnutans, ellipsoidea, acuta, convoluta, apice tantum aperta, 4-4.5 cm. longa, 2 cm. diametro, pulchre kermesina. *Spadix* quam spatha fere duplo brevior, inclusus, cylindricus, obtusus, parte feminea quam mascula subduplo brevior rubra, basi organis neutris (ovariis abortivis) truncatis flavo-virentibus instructa; parte mascula femineae contigua absque staminodiis, flavescente. *Ovaria* oblonga, truncata, stigmatibus sessilibus connata, 1-locularia, placentis brevibus duabus parietalibus basalibus. *Ovula* numerosa, erecta, suborthotropa, longe funiculata. *Antherae* oblongae, compressae, truncatae, apice biporosae.

MALAY PENINSULA. Johor: Gunong Pulai, in fissures of rocks in stream beds in dense forest, H. N. Ridley.

Described from a plant presented to Kew in 1905 which flowered in the Nepenthes House in March 1909.

570. *Catopsis penduliflora*, C. H. Wright [Bromeliaceae-Tillandsieae]; *C. sessiliflora*, Mez, proxima, foliis oblongo-ellipticis acuminatis floribusque pedicellatis pendulis differt.

Folia radicalia, rosulata, oblongo-elliptica, acuminata, 15 cm. longa, 3 cm. lata, supra viridia, nitida, subtus pallidiora, marginibus membranaceis denticulatis caducis; nervi plures, tenues. *Scapus* 35 cm. altus, dimidio superiore racemose ramosus; bracteae 1 cm. longae, herbaceae, lanceolato-subulatae, appressae; rami 6 cm. longi, virides, tereti; flores penduli; pedicelli arcuati, 3 mm. longi; bracteolae ovatae, 2 mm. longae. *Sepala* viridia, 3 mm. longa, aequalia, elliptica, obtusa, glabra. *Petala* alba, 8 mm. longa, 2.5 mm. lata, oblonga, apice rotundata. *Stamina* aequalia, petalis paullo breviora. *Ovarium* oblongum, obtuse trilobatum, 3 mm. longum, viride; stylus albus, 8 mm. longus; stigma trilobatum.

PERU. Forget.

Described from a living plant sent by Messrs. F. Sander & Sons, March, 1910.

XXX.—MISCELLANEOUS NOTES.

Mr. ARTHUR BROOK CULHAM, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, a Curator in the Agricultural Department of Southern Nigeria.

Mr. C. VAN DER VOET, a member of the gardening staff of the Royal Botanic Gardens, has, we are informed, received an appointment in the Botanic Gardens, University of Michigan, Ann Arbor, U.S.A.

Presentations to Museums.—The following miscellaneous specimens have been received since those recorded in Bulletin No. 1 of the present year.

Right Honourable the Earl of Darnley, Cobham Hall, Kent.—Sections of timber of *Liriodendron tulipifera*, *Ulmus campestris*, *Fraxinus excelsior*, *Carpinus Betulus*, *Castanea sativa*, *Quercus pedunculata*, *Cedrus Deodara* and *Pinus Pinaster*.

Right Honourable the Earl of Wharnccliffe, Wortley Hall, Sheffield.—Four sections from trunks of young sycamore trees and four sections from young oak trees. Four sections of wood of Corsican pine and a section of common birch with *Polyporus betuli* growing on same.

Mr. W. H. Johnson, F.L.S., Director of Agriculture, Companhia de Moçambique, Beira.—Several small sections of wood and samples of Cacao nibs from the Island of S. Thomé, also bag made with the seeds of *Leucaena glauca* by natives of Mozambique.

Director, Raffles Museum and Library, Singapore.—Plaster cast of fruit of *Entada spiralis*.

Mr. W. Klemme, Bureau of Forestry, Manila.—Section of "Mancono" wood (*Xanthostemon Verdugonianus*). This tree is found in abundance in north-eastern Mindanao, Philippine Islands, and the timber has been pronounced by the United States Naval Department as a satisfactory substitute for the wood of Lignum Vitae (*Guaiacum officinale*). See Kew Bulletin No. 3, 1909, p. 156.

Mr. Douglas Dering, H.M. Vice-Consul, Manaus, Brazil.—Fruits of *Leopoldinia Piassaba*, the palm furnishing Para Piassaba of commerce.

Mr. R. Tower, H.M. Minister, Mexico.—Specimens of wood of Lignum Nephriticum (*Eysenhardtia amorphoides*). See Kew Bulletin, No. 7, 1909, p. 293.

Mr. John Christie, of Messrs. Ide and Christie, Mark Lane, London, E.C.—Photo-micrographs of Venetian Whisk (*Sorghum vulgare*), Mexican Whisk (*Epicampes macroura*), Kittool fibre (*Caryota urens*), fibre from stem of *Xanthorrhoea australis*, and of transverse sections of the rhizome of *Cymodocea antarctica*, a marine submerged plant used in Western Australia for brush-making. See Table Case, Room VII., Museum No. II.

Messrs. Sutton and Sons, Reading.—A collection of models of vegetables.

Dr. Emile Christ, Reunion.—Samples of Faham tea (*Angraecum fragrans*) and of Vanilla (*Vanilla planifolia*).

Messrs. Bibby and Sons, Liverpool.—Samples of Soy beans (*Glycine hispida*), imported into this country from Harbin and Sakura. Also a collection of 27 specimens of weed seeds.

Mr. James Kelly, Claremont.—Fruits of *Pterocarya caucasica* from a tree growing at Claremont, Esher.

Mr. A. King, White Rock, Hastings.—Hat-pins with heads formed of the fruit of the water chestnut (*Trapa natans*), also hat-pins, necklet and charm of Rhodesian mahogany seeds (*Afzelia quanzensis*).

Mr. S. T. Dunn, F.L.S., Superintendent, Botanic and Forestry Department, Hong Kong.—Chinese chair made of blackwood (*Dalbergia* sp.?).

Mr. A. E. Evans, Botanical and Agricultural Department, Gold Coast.—Specimens of various economic products from Aburi and Tarkwa, including pods of Divi Divi (*Caesalpinia coriaria*), Soy beans (*Glycine hispida*), fruits of allspice (*Pimenta officinalis*), and of wild clove (*Pimenta acris*). Samples of rubber from the Para Rubber tree (*Hevea brasiliensis*). These samples have been submitted to Messrs. Lewis and Peat, Mincing Lane, London, E.C., who report upon them as being of excellent quality and equal in value to best plantation rubber.

Some well prepared rubber from the Lagos silk-rubber tree (*Funtumia elastica*) was also received, and a sample of camphor prepared from trees of *Cinnamomum Camphora* grown at Aburi. This latter sample was reported upon by Messrs. Bowyer and Bartleet, Fenchurch Street, London, E.C., under date March 4th last, as being of fair quality and of the value of about £6 per cwt., and comparing very favourably with China crude camphor.

J. M. H.

Sapium anadenum, Pittier, and *S. pleiostachys*, Schum. and Pittier.—In *Hooker's Icones Plantarum*, t. 2889, these proposed species were reduced to *S. jamaicense*, Swartz. Thereupon Mr. Pittier wrote questioning the correctness of this step, which was primarily taken in consequence of an error of his in identification. At that date Kew possessed no authenticated specimen of either *S. anadenum* or *S. pleiostachys*; but Mr. Pittier had referred Donnell-Smith's 2607, from Guatemala, to the latter. This number is represented at Kew, and is, as Mr. Pittier now admits, true *S. jamaicense*, so there was some justification for the assumption that the rest of the specimens he had under observation were conspecific with the Guatemalan plants. With regard to the reduction of *S. anadenum*, I was influenced by the fact that glands are sometimes present, as shewn in his photographic figure, and Pittier's own statement that it "might prove identical with *S. pleiostachys* on examination of more complete material," decided me.

However, through the courtesy of the Curators of the United States National Herbarium at Washington the original specimens of *S. anadenum* and *S. pleiostachys* have been sent to Kew for examination and comparison. The result is that I now think they may both be accepted as valid species, restricted, so far as present knowledge goes, to Costa Rica. Both differ from *S. jamaicense* in their leaves being borne on relatively long, slender petioles and in their less numerous, less conspicuous lateral veins; in their shorter,

clustered flower-spikes, and in floral details. From each other they differ in the following particulars :

Petiolar glands prominent ; midrib channelled above ; flower-spikes slender, equal in length	<i>S. pleiostachys.</i>
Petiolar glands obscure or absent ; midrib not channelled above ; flower-spikes stouter, unequal in length 	<i>S. anadenum.</i>

The latter is one of the few species showing well-developed bracteoles subtending both male and female flowers.

W. B. H.

Pogonopus febrifugus, *Benth.*, var. *macrosema*, *Hutchinson*, var. nov. ; a typo sepalis petaloideis duplo majoribus differt.

BOLIVIA. La Paz Prov. : in woods near Pata, March, 1865, *Pearce* ! Eastern Bolivia : in forests, *Gosling* ! South Bolivia : Tarija Prov. ; San Luis, April, 1864, *Pearce* ! Chuquisaca Prov., *Fiebrig*, 2705 ! ARGENTINE REPUBLIC. Oran, July, 1873, *Lorentz* et *Hieronymus*, 384 !

Beautiful flowering specimens and samples of the bark of this plant were collected in the forests of the eastern provinces of Bolivia by Mr. Cecil Gosling, who has recently been on a journey in this region under the auspices of H.M. Government. He states that a decoction from the bark is there used as a substitute for quinine, and that this has the local reputation of being "better than any drugs obtainable from the chemist." The bark of the species has the same reputation and is known as "quina morada" ; a note on the alkaloid which has been separated from the bark was published in the *Pharmaceutical Journal* for March 30, 1889.

Chrysosylon febrifugum (*Pogonopus febrifugus*, *Benth.*) was described by Weddell in 1849 (*Hist. Nat. Quinq.* p. 100) from a specimen collected by him in the province of Cordillera, Bolivia. This specimen consists of leaves and an infructescence only, and no flowers ; the leaves are very shortly petiolate and quite densely tomentose on the lower surface, whilst the infructescence is glabrate. In 1854, however, discovering that the name *Chrysosylon* had already been used for another genus, he added an emended description, and a figure of the species under the name of *Howardia* (*Ann. Sci. Nat. Ser. iv. vol. i. p. 65*), and included a flowering specimen collected by him in 1846 in the province of Enquisivi. Owing to the kindness of Prof. Lecomte of the Paris Natural History Museum, we have been able to examine this plant and have found that the leaves are distinctly petiolate and merely pubescent on the lower surface and not sessile and tomentose as in the type, whilst the inflorescence is tomentellous or almost tomentose. On account of these slight differences, therefore, we are rather doubtful whether Weddell was correct in considering these two specimens to represent the same species ; but, on the other hand, he may have made observations in the field which induced him to adopt this view.

When compared with Weddell's original specimen, unfortunately so imperfect, our plant might readily be considered to be specifically distinct, but if we accept his later conception of the species we must, in the absence of critical field notes, consider it to be only a variety.

J. H.

Micholitzia obcordata, N. E. Br.—When the genus *Micholitzia* was described in the *Kew Bull.*, 1909, p. 358, the exact locality in which Micholitz collected the plant on which the genus was founded was unknown. According to Messrs. Sander and Sons the plant was received from Micholitz probably along with *Dendrobium regium*.

In a collection made recently in various parts of India and Indo-China by Mr. A. Meebold, part of which was forwarded to Kew for determination, the writer found a specimen of *Micholitzia* which appears to be *M. obcordata*. The plant collected by Mr. Meebold agrees in the structure of its flowers with the type specimen of *M. obcordata* preserved in the Kew Herbarium but differs from it slightly in the shape of its leaves and the colour of its flowers. The notch at the apex of the leaves is, on the whole, much more pronounced, the leaves are slightly longer, and the corolla instead of being "olivaceo-virens" is bright yellow. It does not seem improbable, however, that these differences may be due to cultivation. Mr. Meebold collected his plant in Manipur, at Laimatak, at an elevation of 1,200 m. where it grew apparently as a parasite.

From the above information it seems probable that, of the two localities—India and Burma—suggested by Messrs. Sander for Micholitz's plant, the latter is the more correct.

W. G. C.

Botanical Magazine for July.—The plants figured are *Begonia Martiana*, Link et Otto, var. *grandiflora*, Garnier (t. 8322); *Iris Clarkei*, Baker (t. 8323); *Philadelphus Delavayi*, L. Henry, (t. 8324); *Aristolochia moupinensis*, Franch. (t. 8325); and *Rhododendron flavidum*, Franch. (t. 8326).

The *Begonia* is an attractive variety of a Mexican species, and has been in cultivation for the last twenty years. It is a tuber-bearing plant, and when well grown it has an erect stout stem 1½ ft. high, producing in profusion clusters of large rose-pink flowers. *Iris Clarkei* comes from Sikkim, where, at an elevation of about 10,000 ft., it was first discovered by Sir J. D. Hooker in 1848. The material for the figure was grown in the garden of Mr. W. R. Dykes, who has noted considerable variation in the form and coloration of the standards. It was first placed in the *Pseudevansia* group, but further investigation has shown that it is allied to *I. Delavayi*, Mich., a member of the *Apogon* group. *Philadelphus Delavayi* is one of the smaller-flowered species, a good grower, floriferous and fragrant. It was first introduced into Europe by the Abbé Delavay, who sent seeds from Yunnan in 1890; later, it was sent from the same region by Mr. E. H. Wilson when collecting for Messrs. James Veitch & Sons, who raised the plants

which provided the material for the figure. The *Aristolochia* is a hardy species, also obtained from Western China by Messrs. Veitch, and grown in their Coombe Wood nursery. Its flowers have a pale green tube 1 in. long, and a three-lobed spreading limb, $1\frac{1}{4}$ in. across, yellowish, with red markings. The *Rhododendron* is a dwarf plant, with small leaves and rather small, very pale yellow flowers. Like the two preceding species mentioned in this note it was obtained from Western China, grown, and flowering specimens of it sent to Kew by Messrs. Veitch. Under the name of *R. primulinum*, Hemsl., it was described in the Gardeners' Chronicle, 1910, vol. xlvii., p. 4.

The Flora of the North-western States, Malay Peninsula.—Sir Joseph Hooker has forwarded to Kew a very interesting letter which he has received from Mr. H. N. Ridley, Director of the Botanic Gardens, Singapore, on his recent journey to the States of Kedah, Perlis, and Setul, in the North-West of the Malay Peninsula. Mr. Ridley has kindly permitted us to publish it in the Bulletin.

Botanic Gardens, Singapore.
March 24, 1910.

DEAR SIR JOSEPH HOOKER,

I have just returned from a trip to the North-Western States, Kedah, Perlis and Setul, my object in going there being to find out where the Malay flora ended and the Siamese one began.

Many years ago I went to Gunong Terai (Kedah Peak) expecting to find traces at least of the Siamese flora, but it was all Malayan. This time I went first from Penang to Alor Star, the capital of Kedah. The country here is largely a flat plain with distant hills. These hills are of sandstone, while Kedah Peak (and a hill a little north of it, Gunong Peak I am told) is composed of granite like that of the main chain of the Malay Peninsula. Alor Star is mostly under rice cultivation, but I got to one sandstone hill with some forest on it and found that the flora was totally different from that of the Malay Peninsula further south. The rice-fields were very much dried up, but what of their flora I could get was again quite different from that of the flora of the rice-fields of Malacca, &c. Further north at Perlis and Setul it was even more marked. The absence of *Homalomena*, *Schismatoglottis*, *Calophyllum*, *Sonerila*, *Lipocarpa*, *Ochtocharis*, *Oncosperma*, *Korthalsia*, *Argostemma*, *Urophyllum*, *Lasianthus*, *Orania*, *Arenca*, *Pinanga*, *Livistona*, *Eurena glomerata*, most of the common *Cyper*i, *Spathoglottis plicata*, *Cyrtandra* and many other characteristic Malay plants was most marked, while such genera as *Garcinia*, *Adinandra*, *Castanopsis*, *Raphidophora*, *Quercus* were scantily represented, as well as *Hornstedtia*, *Ophiorrhiza*, *Anonaceae*, *Dipterocarpeae*, *Myrsineae*—all very scarce. On the other hand we had such plants as *Hapaline*, *Heterophragma*, *Adenophylla*, *Capparis*, *Exacum*, *Geissaspis*, *Smithia*, *Careya*, an increase in the number of *Desmodium*, a number of *Pimbristylis* new to me, *Albizzia*, *Acacia*, *Drosera*, *Osbeckia*, *Corypha*, an erect *Baetris*-like *Calamus*, *Thysanotus* and *Pachystoma*, besides an entirely different set of grasses, *Sterculia elata* and *S. ? foetida*.

Dotted over the flat country of Perlis and Setul are large isolated hills of limestone looking like islands in the flat plain of heath and rice-field; and islands they have been not long ago according to the Malays; this too is shown by their containing caves full of sea-bird guano. These seabirds have long gone; one sees none even about the sea. Round these limestone hills run rivers, and pools of water lie at the base where the rivers are not, and at Setul the vegetation at the base consists of *Acrostichum aureum*, *Acanthus ebracteatus*, *Pandani*, *Barringtonia*, tidal *Ficus*. It is clear that this land is of modern formation and that the south of the peninsula, from near Kedah Peak southwards, was cut off from the Siamese States by sea. Kedah Peak I have reason to believe itself was an island at one time. A big chain of limestone hills rising to 2,000 feet runs from the north to the sea at Perlis, dividing Setul from Perlis. These limestone hills have a very homogeneous flora of which *Cycas siamensis*, *Impatiens mirabile*, *Dracaena cordylinoides*, *Adiantum*—*gomphophyllum* I think, *Euphorbia trigona*, *Hapaline*, *Amorphophallus haematospadix* and *A. carnea*, *Calanthe rubens*, *Eulophia Keithii*, *Chirita Viola* are characteristic. We found another balsam, but only two plants in flower, one with one flower only. It is very succulent, and when we tried to bring it home alive, dried up like a straw. It has large flowers of the coalscuttle shape, white with blue on the lip, much like the plant from Lenggong limestone hills, if not the same. *Impatiens mirabile* was common in places, its stems sometimes 6 inches through, of the quaintest shapes. It was here and there coming into flower and I saw one branched raceme, but most were out of flower. *Cycas siamensis* is very odd-looking. It grows on the highest precipices, hanging down and looking like some extraordinary snake. At Setul are some heaths, dry and sandy, with trees reduced largely to bushes, perhaps from fires. A dwarf bamboo is very common, and here we got the pretty pink *Habenaria Downii*, *Pachystoma* with violet-pink petals and a yellow lip, many *Commelinaceae*, *Drosera Burmanni*, *D. indica* and a *Thysanotus*, apparently not the Hongkong one as the leaves are terete and the petals prettily fringed. Three species of low shrublets (*Apocynaceae*) with pure white flowers, after the style of Oleander, are abundant and a very pretty dwarf shrub mallow with large crimson red flowers, an *Osbeckia*, *Stylidium* (the one we get at Malacca), many *Limnophilae* and *Fimbristylis*. In damper spots are small forests of *Melaleuca Leucadendron* fringing the outer edge of the tidal flora. This is undoubtedly wild here. Of course we know of similar woods in Malacca but there has been a story that the plant was introduced by the Dutch and only occurs round Dutch settlements. It is quite clear now that the tree is really indigenous.

We got many other plants which are quite new to me and are not at all like anything Malayan but look Indian.

The prevalence of thorny plants, *Acacia*, *Albizzia*, *Gardenia*, *Canthium*, *Quisqualis*, *Capparis* was as characteristic of the drier parts, especially the edges of the limestone hills at the base and the sandy spots, as it was troublesome to get through. In the rice-fields the characteristic tree was *Dolichandrone Rheedii*, usually a tidal-swamp bushy low tree, but it was dotted over the rice-fields in the form of a tall, erect-branched tree, with scanty leaves, and

looking like a disorganized poplar about 50 or 60 feet tall. Its fragrant flowers open after dark and fall before 7 a.m.

The Lankawi islands whence Curtis brought so many fine things are obviously a continuation of this main mass of limestone hills and their flora is also not Malayan and very similar. The seas off Setul and Perlis are very shallow and obviously silting up, and in time I should think the Lankawi islands would be standing in a silt plain like that surrounding the limestone hills of Perlis and Setul.

The Malayan flora then ceases about Gunong Terai. North of that is Siamese flora. It should be mentioned too that there is not only a distinct change of rock from granite to sandstone and limestone but of climate also, as there is a more distinct dry season north of Penang, both of which factors have undoubtedly an influence on the flora.

This is a long letter, but I thought you would like to have details of this curious change of flora. I have not yet begun to work out the collections, which are pretty big, so that there will be many more Indo-Siamese things to record. The season had been very dry, and many things perhaps had quite disappeared, which in the wet season we should have got.

By the way I never saw anything like the *Haemaria discolor* on some of the limestone rocks. We crept through a tunnel in one of the hills and found ourselves in a large circular space surrounded by lofty precipitous walls, and on the sides and fallen slabs of rock the *Haemaria* formed dense mats many feet across. The whole place was red with it.

* * * * *

HENRY N. RIDLEY.

Jequié Maniçobas.—In the *Kew Bulletin*, 1908, pp. 59–68, an account was given of the three new species of *Manihot* from Bahia discovered and described by Dr. Ule. In the course of the same year a large quantity of the seeds of two of these species, *M. dichotoma* and *M. piuhyensis*, was obtained from Brazil and distributed to botanical and agricultural stations in the tropics (*K.B.*, 1908, p. 451). Several reports have been received as to the germination of the seed. In nearly every case the percentage of germination of the seeds of *M. dichotoma* was fairly high, but the results with *M. piuhyensis* were not so favourable, except apparently in the case of the seeds sown in the Botanic Station, St. Lucia, W. Indies, where the seeds were slightly filed near the hilum and about 25 per cent. germinated (St. Lucia, Botanic Station Report, 1908–09, p. 4). From Borneo we were informed at the beginning of this year that plants raised from the seed sent in 1908 and sown early in December were planted out when about 10 in. high; at the time of writing (Jan. 1910) the trees of *M. dichotoma* were 5 ft. high, some having a girth of 4 in. The young plants of *M. piuhyensis*, though not so tall are stated to be larger in girth.

Some interesting information as to the growth of the new *Manihots* in Ceylon has been given in the *Tropical Agriculturist* for May and November, 1909. The plants sent out in May, 1907

(K.B., 1908, p. 61), were planted 20 × 20 feet apart on level ground in October, 1907. The twelve largest plants averaged 3 in. in girth, 3 feet from the ground, in May, 1908, and 6-7 in. in November, 1908. It is stated that months ago, before April, 1909—the time of writing—these trees had begun to produce seed. No tapping experiments had been made, but a drop of the latex is stated to appear to be decidedly rich in rubber (Trop. Agric. xxxii, May, 1909, p. 411).

A good illustration of the young trees in the experiment station at Peradeniya accompanies the article. In November the previous account was supplemented by a further article on *Manihot dichotoma* (Trop. Agric. xxxiii, Nov. 1910 p. 385) which occupied a three-acre plot at the experiment station. The average girth of the 98 trees on the plantation was at the time of writing 9 in. at 3 ft. from the ground. The 14 largest trees, however, showed an average circumference of 14 in. A second plot planted in November, 1908, 12 × 12 ft. apart, had at the end of the first year a girth of 6 in. and were “already producing seed in considerable quantity.” The land on which these trees were grown was kept cultivated and this treatment appears to have been beneficial. The plants of *M. dichotoma* raised from seed are said to be extremely variable in vegetative characters, especially as regards leaf shape and also the capsules. On some trees the capsules are smooth—like those of *M. Glaziovii* but larger—whilst on others they bear high crinkled ridges or wings. It appears that the trees which resemble Ceara as regards leaves usually differ widely in respect of the capsules and *vice versa*, but there is said to be no difficulty as to confusing the two species.

The winged capsules of this species are well shown in the figures in *Hooker's Icones Plantarum*, vol. xxix, tt. 2876, 2877, which were prepared from material sent to Kew by Mr. J. A. Davy, Riberião Preto, São Paulo, Brazil.

The variability exhibited by the trees suggests that the rubber yield may also be variable and indications to this effect have been noticed in Ceylon. Although the twelve trees tapped were only 2 years old and the rubber yield was small, “more than ten times as much rubber was yielded by the best as by the poorest yielder.” Care should be taken therefore to insure that seeds or cuttings should be used from those trees only whose yield of rubber is high and this caution is doubtless equally applicable to the selection of seed from *Hevea brasiliensis*. A short note on the growth of Maniçoba rubber trees in the Malay Peninsula appeared in the number (11) of the *Agricultural Bulletin of the Straits and Federated Malay States* for November, 1909, p. 522. The seedlings of *M. dichotoma* and *M. piauhyensis*, on Tebrau estate, Tampoi, Johore, then 10 months old, showed a more rapid growth than Para rubber seedlings, the biggest plant being over 15 ft. high and 8 in. in circumference at 3 ft. from the base. The soil is light and sandy and the annual rainfall is about 100 in. At Singapore the results were similar, the young trees being from 8-12 ft. high, with an average girth of 4 in. According to an account published in the *India Rubber World*, May 1, 1909, pp. 279, 280, an American firm some 4 years before began to lay out plantations of “Maniçoba

Rubber," near São Raymundo, Piahy, Brazil, which are now becoming important. The Jequié and Remanso rubbers—*M. dichotoma* and *M. piahyensis*—were the species planted and plantations were made in different situations. Some particulars as to the mode of tapping and the yield are given. The trees can be tapped when 3-4 years old, and there are two seasons of about 15 days each in the year. An average of 1 lb. of rubber per tree per year is considered a satisfactory yield, though 2 lbs. per tree has been obtained. The best time for tapping is said to be just after the rainy season when the leaves are falling. In a dry season the yield is markedly less. Some good figures of *M. piahyensis* and *M. dichotoma* illustrate the article.

Cultivation of *Funtumia elastica*.—The Director has received the following interesting letter from Mr. G. L. Bates, Bitya, Ebolova, Cameroons, W. Africa. Mr. Bates went out to W. Africa in 1895, and in that and the following year communicated to Kew two sets of plants, numbering 297 specimens, from the neighbourhood of Batanga. In 1897 a set of 116 was received from him from the M'Komo river—as the Gaboon river is called above the estuary. These collections contained several new species, some of which have been named after him :—*Impatiens Batesii*, Wright, *Luffa Batesii*, Wright, *Mostuca Batesii*, Wright, *Oncinotis Batesii*, Stapf, &c.

Bitya, Ebolova,
6 Nov., 1909.

DEAR SIR,

I HAVE lately looked over with interest some old numbers of the Kew Bulletin which were sent to me in 1896-8 because they contained descriptions of some new plants that I had found and sent to Kew. Though I have not since been engaged in botanising in that way, I have become interested in the practical side of botany lately through attempts to raise a few rubber trees here. So I write to you of a few things I have learned by experience in that line, in the hope that you might find some parts of my letter of sufficient interest to publish in the Kew Bulletin.

The place which is now my residence is about 200 miles, by the crooked path—in a straight line it would be less—due east from Kribi on the coast. It is near the river Ja (or Dscha) where it makes its bend to the west, and is thus in the basin of the Congo.

The trees I have planted are *Funtumia elastica*, commonly known among white people who do not care for botanical accuracy as "Kickxia," and among the Bulu natives as "Eté." This species grows wild in this region, though not as abundantly as it does still further east, towards the eastern boundary of German territory. It is the only species of the genus found here, I believe; but between here and the coast *E. africana* is found. In buying seeds from the natives one has to be careful to get those of the right species.

I may here confine myself to what I have done this year, in starting from the seeds 1,000 trees. Some not very serious attempts

during 2 or 3 previous years need not be related, because the failure was due to causes that everyone ought to know to avoid, namely lack of sufficient care and cultivation.

My seeds this year were obtained in January, in the principal dry season, from pods then bursting on wild trees. In February I put them in moist earth, in little boxes, till they began to germinate. It is a month from the time the tip of the radicle emerges from the seed till the seed-leaves have fully opened. Thus my little seedlings were started by the time the rains began, in March.

Some were started in little cylinders made of hollowed-out short sections of the large leaf-stalks of the *Raphia* palm, the "bamboo" of this country. This method made easy work in transplanting, but it has not turned out well, and I will not try it again. The little trees so started have not grown so well as the others, and I think that the shell of hard palm wood has hindered growth by confining the roots. Some were started in tiny paper boxes, made of half envelopes cut in two, or of folded paper, filled with earth and set close together in a sort of shallow tray of native make. These trays could be easily handled, kept up on my verandah, watered, and set in the sun or the shade. The seeds in these paper boxes all grew. During the month the paper became soft, but it still held together sufficiently to keep the earth about each plant in a separate lump, and made transplanting easy. This was done on rainy days. The trees started in this way have grown well. Some others merely started in a bed in the ground, which was kept watered, were transplanted also in the first rains and did well.

The ground where the trees were planted permanently was all cleared and burnt over before the rains, and a small space was dug up with a hoe at the spot where each tree was to stand. I had not started enough seedlings to fill all the places thus prepared, and in the remaining places I planted seeds. These came up very poorly—in fact, only a small fraction came up. Some seemed to be rotted by the abundant rain; many seemed to be unable to break through the hard crust formed on the surface of the ground by the rain and hot sunshine during the long time it takes them to germinate. They might perhaps have come up better if planted shallower. Yet I think the best way is to plant the seeds in papers or beds before the rains begin, and water; and then transplant during the rains.

As for the growth of all these plants started in these various ways it has been, during the eight months up to the present time, mainly in proportion to the amount of hoeing they have had. On most parts of the ground, native crops have been planted between and about the little trees. Maize did not seem to hinder their growth, but cassava, and especially sugar-cane did so, if planted too close. One crop seemed to be not only not a hindrance, but a positive aid to the growth of the little trees, and that is ground-nuts. This may be due to the fact that the patches of ground-nuts were carefully tended and kept free from weeds by the native women, and were then all thoroughly dug up when the crop was dug. But I think possibly the plants of *Arachis hypogaea* have some positive beneficial effect on the soil. At any rate the little *Funtumia* trees growing where the rows ran through native ground-nut patches

have made better growth than any others. Some of these, and a few of the others, have attained a height of 2 feet, or a little more.

The average growth of the 100 plants has not been half that of these few favoured ones. Many have made a poor growth for the reasons already explained, namely, the confining of the roots by the palm shells in which some were planted, or the feeble constitutions of those few which came up from the seeds planted directly in the permanent rows after the rains began and beat the ground hard. Besides these, many are still small because they have been cut off by insects—I do not know of what kind. This insect cuts off the two highest leaves and the terminal bud between, and does it in the night. Plants so cut die if so small that no buds are left below the cut; if buds are left, these grow, but very slowly. The little trees suffered from this cause even before transplanting, excepting those that were started in the trays on my verandah.

Trees of the size reached by these 1,000 now, as well as the few larger ones started in previous years, are liable to be injured by caterpillars which, if not removed, strip them of their leaves. I go over all my trees about once in a week or 10 days, and remove the caterpillars, which are easy to see and are never found on many trees at once. At the time when I was transplanting, last March, I also planted more seeds in nursery rows near my house. Here the ground was kept loose and clean; the seeds came up well and the plants grew well. These were left over the dry season of June–August. There is a double year of two dry and two rainy seasons here. About the last of September, on several rainy days, I transplanted them into the places where trees were missing of the first planting. These trees last transplanted had grown to such a size that setting them out made much more work than the first transplanting in March, but most of them have lived and are beginning to grow again.

When the little *Funtumia* trees are about 6 inches high they begin to dichotomize. I have always picked off one of the terminal buds, whenever I have found two. This seems to be necessary in order to give the trees the proper shape at the start.

GEO. L. BATES.

Rubber Trees as Shade for Cacao.—Mr. A. E. Casse, who left Kew in March, 1900, to take up the position of Superintendent of the Plantations, Bayeux, Haiti, has sent the following notes on rubber trees as shade for cacao to the Director for publication. The question as to ‘Shade or No Shade’ for cacao has received considerable attention in the West Indies, and a short summary account of the matter with a list of reference will be found in the Kew Bull. Additional Series ix, pp. 98 and 102–104.

“As well among colonial planters as in the pages of periodicals devoted to tropical agriculture, a question often discussed is this: ‘Can India Rubber and Cacao successfully and economically be

cultivated on the same field, and are the advantages derived from mixed cultivation sufficiently great to counterbalance the pernicious influence which one species may exercise upon the other?

"It is generally accepted that the cacao tree during all stages of its development requires some shade and shelter, and it becomes naturally desirable to use for these purposes trees which could at the same time yield a product, and add to the revenue of the estate.

"Shade or shelter in cacao planting must be considered under two different heads according to its purpose and character, namely as *temporary* and *permanent* shade.

"Under the term *temporary shade* we wish to refer to the protection required during the first years after the establishment of the plantation, before the trees planted for permanent shade have grown up. Since young cacao trees under all circumstances require more shade than mature ones, the temporary shade has to be more dense, and for this purpose therefore rapidly growing plants with large and abundant leaves are generally employed, as for example bananas. No rubber plants are suitable for temporary shade, and in the notes which follow, conditions governing the planting of permanent shade trees will therefore be exclusively considered.

"The requirements for shade vary considerably according to locality, variety of cacao, and distance at which the cacao trees are planted; whilst protection against prevailing winds will almost always be necessary. Overshading is often practised, and the prevalence of much fungoid disease is often due to mistakes in this direction.

"An ideal shade tree should answer the following requirements:—

"A tall-growing tree developing its branches about 12 feet above the ground; the branches should be strong and elastic, not liable to breakage in storms. The tree should be a subsoil feeder, and should change its leaves annually, without being decidedly deciduous. It should be a rapid grower, and yield a marketable product, without drawing too much on the fertility of the land. It should of course be a tree not requiring shade for its own proper development.

"It would carry us too far to review here the numerous trees which are met with planted as shade among cacao; few or none answer all the above mentioned requirements. What particularly interest us are the commonly planted rubber trees.

"*Hevea brasiliensis* is a tall and rapid grower, developing a good and high shade. It is however a surface feeder with a very dense root system, liable to mat the soil and thus interfere with the development of the cacao roots. As has been proved in the West Indies, *Hevea* may grow well without developing sufficient latex to pay tapping, and it cannot therefore be generally recommended.

"*Funtumia elastica* is decidedly a forest tree, requiring shade for its own development and can therefore be left without further consideration.

"The species of *Ficus* offer great advantages as windbreaks, planted at some distance from the cacao, as for instance on the opposite side of roads or canals. For shade inside the plantation they are too bulky and the root system is too wide and dense.

"The *Manihot* species, except *Manihot Glaziovii*, which is of a doubtful value as a rubber producer, grow too low. To this it must be added that the branches of all species of *Manihot* are very brittle, and that these trees prefer soil and climatic conditions which do not suit the cacao tree.

"*Castilloa elastica*, therefore, remains as the rubber tree most likely to give satisfaction, and it is probably also this tree which has most frequently been tried and recommended. A native of the same countries as *Theobroma Cacao*, its general climatic requirements are the same. As regards soil, *Castilloa* thrives well on any good cacao land, but it is less particular, and will grow well on both lighter and heavier soils when the drainage is satisfactory. *Castilloa elastica*, like the cacao, prefers much water and atmospheric humidity, but it is very susceptible to damage through the least stagnation of subsoil water and acidity of soil.

"Although *Castilloa* in its native country is found growing in the forests it is not really a forest tree, but a 'Tree weed' as it has been termed by Mr. O. F. Cook, in his report on 'The Culture of the Central American Rubber Tree,' Washington, 1903, by which term he understands a tree which can not grow up in the natural forest, but will develop rapidly on clearings, old garden sites, &c., where the slower-growing forest trees follow and surround it. In cultivation it is able to develop to perfection without shade, even on rather dry land, though it grows more rapidly when slightly shaded during the first years.

"On fair cacao land, *Castilloa* will reach a height of 25 to 30 feet within the first 4 years, and it is only when the tree is about 3 years old that it commences to develop permanent branches; before this the only branches developed are pseudo-branches which, like the leaves, are shed every year. The pseudo-branches carry all the foliage of the tree, and when the growth is healthy the development both on the main stem and on the permanent branches is very rapid. The permanent branches remain few, but with their abundance of pseudo-branches, they form a dense crown affording good shade.

"In localities where dry weather prevails during the months of March and April, the habit of *Castilloa* is decidedly deciduous, and it drops all its pseudo-branches during a short period; while in districts where the spring weather is damp the change of foliage is gradual. The fact that the tree may thus stand naked for some time forms the principal objection to its usefulness as a shade for cacao, whilst the abundance of mulch formed by its leaves is a point in favour of its planting.

"On fertile cultivated land *Castilloa* is a surface feeder, and develops very heavy roots, which run far, without however forming a dense system, as is the case with *Hevea*. When manure is dug down for the benefit of the cacao trees, the roots of both cacao and rubber develop equally well in it, very differently from what is the case when manure is dug into land planted with bananas and cacao, in which case the banana roots grow rapidly and densely into the manure to the exclusion of the cacao roots. It would appear that the roots of cacao and *Castilloa elastica* agree well in the same soil. The facts that the crop of rubber removes practically nothing

from the land, and that the evaporation of water from the *Castilloa* tree is likely to be less than from ordinary shade trees, speak in favour of its extensive planting among cacao.

"It has often been stated that *Castilloa elastica*, under cultivation, will not yield rubber in paying quantities. It would go beyond our object on this occasion to enter into a description of the methods and economies of rubber tapping; we therefore limit ourselves to stating that, if the right varieties be chosen for planting, excellent returns may be obtained."

Guayule Rubber.—An account of this Mexican source of Rubber, derived from *Parthenium argentatum*, A. Gray, was published in the *Bulletin* 1907, pp. 285–294, with a further note in the *Bulletin* for 1908, p. 255. In 1907 some seeds of *Parthenium argentatum* and also of *P. incanum*,—a species sometimes confused with the rubber-yielding plant (cf. *K.B.* 1907, p. 294)—were received from the United States Department of Agriculture. The plants of Guayule raised from these seeds are now about 18 inches high and in flower, the stem is woody below and the silvery leaves, 2 inches long, are lanceolate, entire or in a few cases irregularly lobed or toothed. The plants of *P. incanum* have glaucous or silvery hawthorn-like leaves and in their crenate lobation differ markedly from the leaves of *P. argentatum* where the lobes are sharply angular.

Through the kind offices of Mr. Reginald Tower, H.M. Minister, Mexico, two consignments of the seeds of *Parthenium argentatum* were received at Kew in March and April of this year. The first consignment was sent to Mr. Tower by Mr. J. E. Kirkwood of the University of Montana, Missoula, the author of a paper on the "Propagation of Guayule by seeds" in the *American Review of Tropical Agriculture*, vol. i, No. 2, February, 1910, pp. 34–43. The second consignment of seeds was sent by Mr. Tower from Mr. G. Fleming of the Hacienda de Cedros, Mazapil, Zacatecas.

The bulk of the seeds so received has been distributed to Mysore, Baroda, Poona, Lahore, Ceylon (Hakgala), Sudan, Pretoria, Nairobi, Queensland, Port Darwin, Adelaide, Sydney and the Antilles.

The germination of the seeds retained at Kew has been good; the plants raised from the later sending in April are now 6 inches high and bear somewhat silvery, oblanceolate, slightly lobed leaves 3–4 in. long. The older seedlings are a foot high, the whole plant being covered with a fine silvery-grey tomentum; the leaves are 2–5 in. long, narrowly lanceolate and irregularly lobed with angular acute or subacute lobes. Some of the plants, which are already shewing flower heads, have been placed in the Succulent House.

In the *Bulletin* 1908, p. 255, a despatch from H.M. Minister, Mexico, was published, in which the Guayule Rubber industry did not appear to have a very bright future; a further despatch received from Mr. Tower, early last year, indicates that the industry is still in a flourishing condition. The Mexican Rubber Exploitation Company now have a large Guayule factory established in the State of Coahuila and with a new process for the extraction

of the rubber they have confidence in the successful development of the industry. According to the statements made by the head of the company, "Experiments had now satisfied them conclusively that the Guayule plant reproduces itself naturally and abundantly. The roots of the shrub extend to a considerable distance in all directions, and new shoots spring from the roots, growing satisfactorily even after the present shrub has been cut down. Opinions differ about the life of the plant and as to the suitable time for cutting, but the generally accepted view is that between ten and twenty years must elapse before maturity is reached and the plant contains sufficient rubber for commercial purposes." A further despatch from Mr. Tower, printed below, gives some additional information as to the successful development of the Guayule industry.

Mexico,

March 23rd, 1910.

SIR,

WITH reference to my Despatch of this Series, No. 52 of December 3rd, 1906, and subsequent reports concerning the Guayule rubber industry in Mexico, I have the honour to report the following which has been published in the "Mexican Herald" of the 19th instant:—

"More attention will be paid to the culture of Guayule during 1910 than in any previous year. Statistics and reports in the Department of Fomento show that the increase in the production of this rubber-producing shrub has been greater than any other product of the northern section of the Republic.

"A few years ago the shrub only brought \$25.00 (say £2 10s.) a ton in the open market. This price has risen very rapidly, as the splendid properties of the plant have become better known, until at the present time it is selling for \$150.00 (say £15) a ton.

"At the present price the profit to the grower is large and is resulting in a greatly increased acreage in the Northern States of the Republic, where the plant seems to do the best. The estimates in the hands of the Department of Fomento indicate that the acreage for the present year will be more than 30 per cent. greater than that of last year."

I have, &c.,

(Signed) REGINALD TOWER.

The Right Honourable
Sir Edward Grey, Bart., M.P.,
&c., &c.

Some account of the extraction and manufacture of Guayule rubber is given in the *Journal of Industry and Engineering* for April, 1909, and a general account of the plant and the rubber industry by Professor F. E. Lloyd appeared in the *India Rubber World*, Jan. 1st, 1910, pp. 115-118. This article opens with a short history of the plant followed by a description; the methods of rubber extraction, the future and extent of the rubber industry and other matters are also discussed. There are some good illustrations of the plant included in the text.

Epacris



heteronema



breviflora



bawbawiensis



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